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CMHC
Canada Mortgage
and Housing Corporation

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Société canadienne
d'hypothèques et de logement

# Housing Disabled Persons

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# Housing Disabled Persons

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**Canada Mortgage and Housing Corporation**

**Société canadienne d'hypothèques et de logement**

**Honourable Paul Cosgrove**
**Minister**

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# Prologue

CMHC published *Housing the Handicapped* in 1974 (NHA 5076 First Edition 1974, Revised 1975, Reprinted 1977). It is now revised under the new title *Housing Disabled Persons*.

The Foreword, written by Dr Gustave Gingras in 1973, expresses so eloquently the author's intent and the spirit of the revisions, that it is reprinted here *in toto*.

Dr Gingras is now Director of Rehabilitation Services at the Rehabilitation Centre in Charlottetown, Prince Edward Island.

# Foreword*

The fate of our handicapped has not been enviable, nor is it now. We must not fool ourselves. For centuries, the disabled have been objects of pity and commiseration. They have also served as a means for the supposedly normal to vent their feelings of guilt.

Fortunately, for some twenty-five years now, a basic change has been felt. The handicapped have come out of their traditional isolation. They have stepped into public view with their artificial limbs and in their wheelchairs. More and more attend schools, colleges and universities. The handicapped have become a pressure group that now justifiably wants to make its contribution to the growth of Canada.

Too often after being prepared at great cost to fill a role in society, the physically and psychologically rehabilitated handicapped are prevented from filling that role. So-called architectural barriers often frustrate the best-laid plans for the future. A couple of steps, too narrow an exit, a small room, and the individual becomes a prisoner of the environment.

This Canada Mortgage and Housing Corporation publication for which I have the honour to write a foreword, is not a first effort to smooth out and minimize architectural barriers. In 1946, I witnessed important changes and additions to buildings put up by CMHC for paraplegic veterans.

The plans, specifications and diagrams in this handbook are clear, accurate and, above all, simple. The architect, builder and resident will profit from using this manual. It can also serve as a reference manual for rehabilitation teams: doctors, physiotherapists, work therapists and social workers, for whom one of the most important roles, if not the most important, is to reintegrate the handicapped into the family environment.

We must hope that in the near future the federal, provincial and municipal governments will see to it that architectural barriers are a thing of the past in a country that considers itself just and democratic.

G. Gingras
Past President
Canadian Medical Association

Former Administrator,
Rehabilitation Institute of Montreal

*Reprinted from *Housing the Handicapped*, Canada Mortgage and Housing Corporation, 1974

# Introduction

When the United Nations Organization proclaimed 1981 the International Year of Disabled Persons, it was after a lengthy discussion on the uses of the words "handicapped" and "disabled". It was agreed that a disability refers to a person, while a handicap is caused by an obstacle or barrier that obstructs or restricts a person's ability to perform certain activities.

CMHC has now adopted the following definitions when referring to housing or dwelling units:

**Accessible unit** A unit which can be entered by a person using a wheelchair, crutches or other mobility aids, and in which some, or all, of the rooms can be entered too. However, the unit has not been especially designed to accommodate the needs of a disabled person.

**Mobility unit** A unit in which space is provided for manoeuvring a wheelchair but in which there are no special fitments for physically or mentally impaired persons. The unit has been designed for further installation of grab bars, special cabinets and other customized devices but these are not provided. Electrical receptacles, switches and controls are mounted at appropriate heights for wheelchair users and the unit is free of barriers for most disabled persons, including those with visual or hearing impairments, but is not entirely free of architectural barriers for persons in wheelchairs.

**Wheelchair unit** A unit in which all areas and all fitments are especially designed to be used by a person in a wheelchair.

**Especially designed unit for a disabled person** One in which all areas and all fitments are especially designed for independent use by disabled persons in wheelchairs or those who have visual, hearing or mobility impairment. The unit is free of architectural barriers for all users.

Society now affirms an increasing concern for the rights of the individual and acknowledges that every human being, no matter how physically or mentally impaired, can contribute a great deal to society.

Canada's design standards for disabled persons are contained in the National Building Code and in provincial codes. Many cities now provide public transportation for disabled persons; VIA Rail, the national railway, has made it a policy to provide assistance wherever it is needed in stations and on trains. At the same time, a program is being developed to retrofit major railway stations so that they are accessible to everyone. Human rights legislation now makes it illegal to discriminate against disabled persons in employment, and Affirmative Action programs are being developed to implement employment policies. The federal government is retrofitting its public buildings to make them accessible to both consumers and staff. Health, community and social services are studying the possibility of improving personal care services to make it easier for disabled persons to stay in their home community and to be an integral part of that community equal in status with other residents. The impact in the community of disabled persons as consumers and as a solid lobby group is being felt, not only in the design of buildings and in transportation, but in the design of city streets, recreational facilities, parks, and in planning principles. Housing programs are being re-examined to ensure that they do not discriminate against disabled persons.

Until more data has been collected on the cost of mobility units and specially designed units, CMHC is recommending that, in multiple family accommodation built under the terms of the National Housing Act, at least 5 per cent should be mobility units designed so that they can be adapted to the needs of special users. Some cities require that at least 10 per cent of rental accommodation units shall be specially designed for wheelchair users.

The housing recommendations in this document are based on the following goals:

1. Ambulatory persons with moderate disabilities should be afforded a range of choice in the type and quality of residential accommodation made available to them.
2. Moderately disabled persons, including those confined to wheelchairs, should be free to choose where to live in the community; they should have broad access to educational and employment opportunities; and their housing should allow them a maximum degree of independence in performing everyday activities.
3. At least some of the severely disabled persons now confined to institutions should have an opportunity to live in a non-institutional, sheltered residential environment in their home community.

*A disability refers to a person.*
*A handicap is caused by an obstacle or barrier that restricts a person's ability to perform certain activities.*



# Housing Alternatives

The fundamental housing requirement for disabled persons is a great variety of accommodation, in terms of location, type, size and degree of specialized design. Such housing should be located close to the full range of standard and special community services. Since many disabled people earn a low income, subsidized housing suited to their needs should be made available to them. This publication sets out several basic alternative "housing packages" in order to begin fulfilling these aims.

**Minimum Criteria** The first housing type, described in Section 1, attempts to satisfy the need for a large quantity of units, in a variety of locations. The dwelling units would have to be equally suitable for disabled and non-disabled tenants. To provide this flexibility, units are needed which are accessible to disabled persons, but which are not appreciably more costly than conventional units. Analysis of typical modern apartment buildings has shown that only minor modifications are necessary to provide this minimum level of accessibility. Often these can be accommodated within the standard net area of the apartment. Use of the criteria may, therefore, cause only a slight increase in building cost or none at all, a fact which may make them more acceptable to private developers. In this regard, it should be recognized that a building accessible to disabled people is also more easily accessible to children, to mothers pushing baby carriages, and to elderly persons.

**Residential Group Homes** The second housing type proposed is the residential group home. This is a residential unit suitable for a number of disabled persons who require the mutual support of a closely knit, small group. Depending upon the disabilities, ages and wishes of the residents, a residential group home may function as a short-term halfway house or as a permanent residence. A group home should convey a domestic character, and for this reason a maximum group size of ten disabled residents plus a resident director and required staff is suggested. Since the residential group home is intended for a specific group of disabled people, living conditions in the building must be as comfortable as possible. The appropriate design criteria are found in Sections 2, 3 and 4.

**Integrated Housing** An alternative form of housing is needed for those persons who require some services and specially designed units, but who wish to live independently among people who are not disabled. The most suitable arrangement is to reserve a certain number of dwelling units within an apartment building for use by disabled persons only.

The building and the designated units should be designed according to the criteria in Sections 2 and 3. The number and location of the special units is an important factor in the success of the concept. There must be enough units to justify the provision of special services, but not so many that social interaction with the other building tenants is reduced.

It is recommended that about 10-20 per cent of the total number of units in the building be set aside for disabled persons. These units should be dispersed throughout the building to encourage informal contact with other building tenants or owners. An area should be provided, in a central location, within the building, for ancillary offices and possibly some therapeutic facilities. Any social and recreation facilities should be shared with other residents.

Finally, those disabled people who have the means and desire to modify a family house for their own use, will find advisory criteria in Section 4, although much of Section 3 is also applicable.

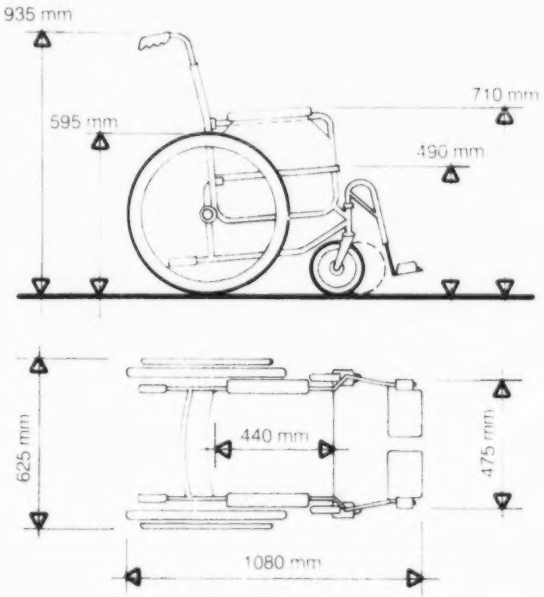
*The great variety of disability types and individual desires call for a series of at least three housing types.*

# Basic Design Principles

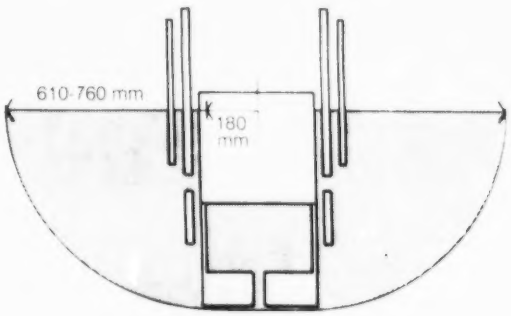
Regardless of the type of disability, certain principles should be adopted in designing accommodation for disabled persons.

1. Everything should be operable with one hand. The second hand may be needed to maintain balance, or it may not be functional.
2. All rooms in the building or dwelling should be readily accessible. Ramps should be provided, as well as steps and staircases. Entrances should be wide enough to permit passage of a wheelchair, and thresholds should not be higher than 15 mm.
3. Space should be allowed inside the dwelling to permit lateral transfer of the disabled person from the wheelchair to the toilet, bathtub, bed and other furniture.
4. The need to bend down and reach up should be minimized. Loss of balance is a common hazard among disabled persons and many have to be kept physically stable all the time. A person's vertical reach from a wheelchair is limited, and frequent stooping and stretching may be physically exhausting.
5. Cupboard doors and drawers should be designed to permit access to storage by the wheelchair user.
6. Storage should be provided to accommodate a wheelchair when it is not in use.
7. All potential sources of injury should be eliminated. There should be no sharp corners, projections from walls or floors that could be hazardous for blind persons, slippery floors, unprotected hot surfaces, or tightly sprung door closers.
8. The dwelling should require minimum maintenance. Many disabled persons are unable to perform all the necessary household tasks and they may be financially unable to purchase housekeeping assistance.
9. Communication with the outside world should be direct and unobstructed. Access routes to the street, to the parking lot and to other homes should be free of stairs, steps and similar barriers.

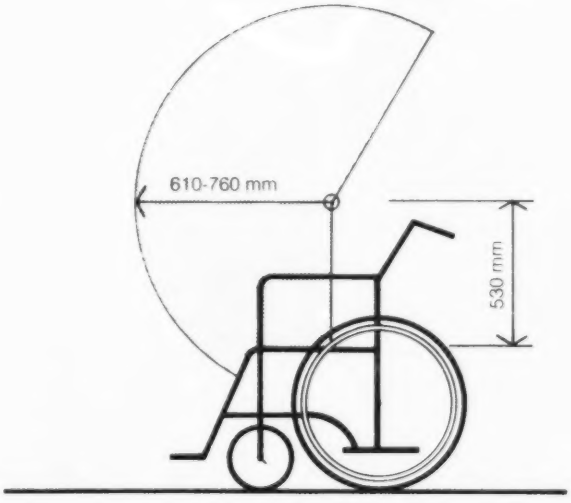
Typical wheelchair dimensions




Approximate adult horizontal reach from a wheelchair




Approximate adult vertical reach from a wheelchair



*". . . this handbook . . . can also serve as a reference manual for rehabilitation teams . . . for whom one of the most important roles, if not the most important, is to reintegrate the handicapped into the family environment."*

G. Gingras

# 1 Minimum Criteria for Apartment Buildings

*A low cost minimal level of convenience for those who need a wide choice in type and location of dwelling.*

*A few very simple precautions at the design stage will make the building fully accessible.*



At relatively low cost, apartment building design can be modified to permit basic access and use by disabled persons. The inclusion of such modifications should be considered for all new multiple-unit buildings. Use of the criteria outlined in this section will allow most persons who have visual or hearing impairments, ambulatory disabilities, and even those using wheelchairs, to enter and move around the building without encountering physical obstacles, and to live in the apartment unit in reasonable comfort.

The principles are most easily applied to elevator apartment buildings of all types, but even walk-up buildings can be designed so that the ground floor is accessible to wheelchairs and other floors are accessible to blind or deaf persons.

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Recommendations in this section are based upon those given in the National Research Council's *Building Standards for the Handicapped*. The National Building Code of Canada, 1980, NRC Publication No. 17669 (Ottawa: National Research Council, 1980).

# Access to the Building

For exterior access, a passenger drop-off area should be provided, with a direct and level route to the entrance and elevator lobby. Some parking spaces should be reserved for use by disabled persons, with direct and unobstructed access to the building.

Visual and tactile directional indication should be provided. Letters and symbols should have a contrasting background. They should be large enough to be easily read by most visually impaired persons and either raised or depressed so that they can be read by touch where this is required. It is sometimes desirable to supplement graphic or visual information with tactile, audible or other sensory information.

Where a change in level is necessary between the exterior and the elevator lobby, a ramp should be provided, in addition to stairs, according to the design criteria outlined on page 23.

The main entrance should be designed for use by disabled persons. Entrance doors should be a minimum width of 910 mm. Automatic sliding doors with speed control are ideal, but normal swing doors that are easy to open and slow to close are satisfactory too. A 300 mm high kickplate will prevent possible damage to the doors by wheelchairs.

A manoeuvring area 760 × 1200 mm should be provided clear of the swing door, with a 600 mm space on the handle side of any door swinging towards a wheelchair. The depth of the vestibule should be no less than 1900 mm.

All residents of the building should have access to its basic facilities. These include the lobby, the main social and recreational facilities, mailboxes, the laundry room, the garbage deposit area and the indoor garage, if one is provided.

Access should not be obstructed by intervening stairs or thresholds; and all hinged doors should have a minimum width of 810 mm and be easy to open and slow to close. There should be a clear 600 mm wall space on the handle side of all doors swinging towards a wheelchair.

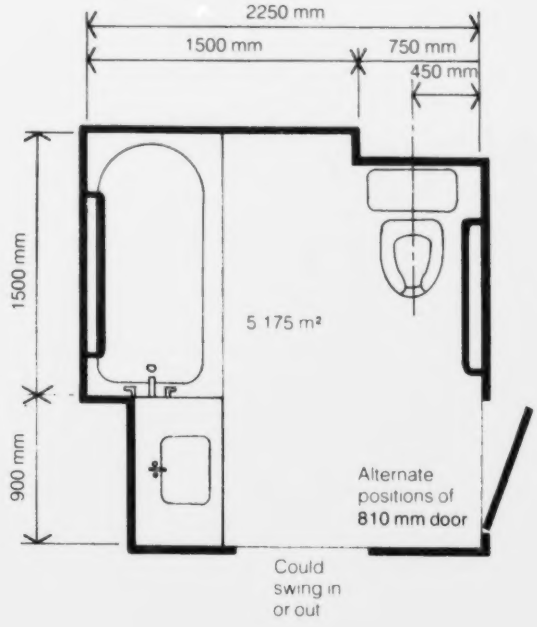
Elevators also must accommodate wheelchair users. Control buttons inside and outside the cab should be arranged horizontally, not more than 1420 mm above the floor; doors that close relatively slowly are desirable.

Washrooms are usually provided adjacent to recreation rooms and lounges. Where provided, these facilities should be designed for disabled persons, in accordance with the National Building Code, *Building Standards for the Handicapped*, 1980.

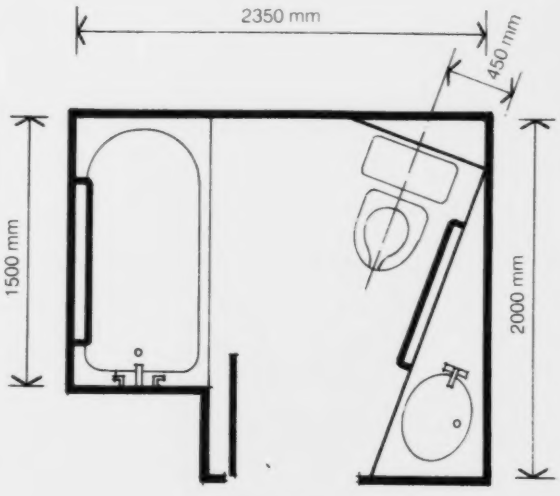
*Door widths and extra space in the bathroom are the main requirements.*



Bathroom layout




Smallest accessible bathroom with in-swinging door




Area of this bathroom is less than 1 m² more than smallest bathroom

# Access to and Use of the Apartment Unit

All apartment units should be designed to enable a disabled person to gain access to the unit itself and to all the rooms it contains.

Corridors should have a minimum width of 965 mm. Doors providing access from the corridor should have a minimum width of 860 mm. All other doors in the unit should be at least 810 mm wide, allowing a clear passage of 760 mm. A clear wall space of 600 mm should be provided on the handle side of an outswinging door.

Where balconies are provided, thresholds should be reduced to a maximum of 15 mm, with one side bevelled. The projecting threshold should be clearly indicated by the use of colour and appropriate lighting.

A slight increase in normal dimensions will make the bathroom usable by the wheelchair occupant. A cantilevered washbasin is recommended to allow wheelchair access: in most cases, an outswinging 810 mm door is necessary for entry. Grab-bars are needed at the toilet and the bathtub or shower.

The operating hardware usually provided for doors, windows and bathroom equipment may be difficult or impossible for a disabled person to operate. Lever door handles should be considered for all hinged doors; window hardware should be large, easy to manipulate and mounted no higher than 1420 mm from the floor; kitchen and bathroom faucets should be equipped with lever handles; and the handles of built-in cupboards and drawers in the kitchen and elsewhere in the unit should be easy to grasp.

*"The handicapped have come out of their traditional isolation. They have stepped into public view with their artificial limbs and in their wheelchairs."*

G Gingras

# 2 Desirable Criteria for Residential Buildings

This section describes design principles and details suitable for buildings in which disabled persons are expected to live with a maximum degree of comfort and convenience. This category could include an apartment building, in which scattered units and all building facilities are designed for this purpose. An alternative is a small group residence designed or renovated exclusively to house disabled people. In both cases, the provisions of this section should be considered as a shopping list of ideas, from which those which are relevant to the actual situation can be chosen.

Because of the greater emphasis on comfort and long-term livability, the requirements of this section are more extensive than those of Section 1. Easy access to all building and dwelling unit facilities is needed for the wheelchair user, and all equipment must be simple to operate. These provisions may result in costs that are a little higher than in normal residential construction.

# Site Planning, Vehicular Access and Parking

The choice of a site for the construction of a new building or the renovation of an old one is a crucial factor in the housing of disabled persons. There should be ready access to shopping and cultural facilities and to community services. The land in the immediate neighbourhood should be relatively flat, because hills may limit the mobility of those who are disabled or who use a wheelchair.

The need and capacity for public activity depends upon the nature of the disability. Many quadriplegic persons, for example, may not wish to be pushed around stores and other public places in a wheelchair. It is important, however, to provide an open choice in the matter; and, of course, persons who are not so severely disabled will welcome the opportunity to move easily about the community.

Because public transportation generally is not designed for use by disabled persons, these people rely heavily on automobiles for travelling to and from their home. Therefore, ample parking space should be provided, as well as convenient access to the building at drop-off points and from the parking area itself.

Approaches to the building should be designed to make it possible for a disabled person to be dropped off directly in front of a main entrance. A roof shelter should be provided, and the walk to the door should be short and direct.

The disabled person who drives can, of course, also park the car. Outdoor parking is not ideal, but it may be unavoidable. In parts of the country that experience severe winter conditions, a sheltered area should be considered a necessity for disabled people. In the case of a very small project, or the renovation of an old building, this may be prohibitively expensive; but indoor parking should be included in medium- to large-size elevator apartment buildings.

An elevator entrance should be provided at each level of the parking garage. If there is a change of level between the parked car and the elevator, the access route should be ramped (see pages 23 and 24).

Parking spaces to be used by handicapped persons should be 3600 mm wide and identified by a sign or symbol. Spaces to be used by disabled persons should be located as close as possible to an entrance. The driver or passenger should be able to get into the car without being endangered by other parked cars which may back out without warning. Also, it should be possible to operate garage doors without leaving the driver's seat.

*Pleasant outdoor spaces are an integral part of a well designed building.*





# Gardens and Terraces

Many disabled persons, particularly those who are elderly, spend most of their time in and around their dwelling unit. A garden or other outdoor recreation area is desirable, to provide an opportunity for visual stimulation, fresh air, exercise and the pursuit of a satisfying hobby. An indoor planting area or greenhouse also may be designed for buildings in the colder parts of the country.

Terrace and garden areas may be designed for exclusive use by disabled persons, but more commonly they will be used by able-bodied persons as well, particularly in a mixed-use apartment building.

A garden may contain a variety of flowers, trees and shrubs. These should be planted in attractive arrangements, leaving a generous amount of open space to facilitate movement around the garden and to permit outdoor games. Because the garden may be used by blind persons, prickly and toxic plants should be avoided or planted in areas that are not easily accessible. Where access is desirable, for examining or tending plants, the planting area should be raised to a height of 600 to 900 mm.

The garden area should be as level as possible, without interfering with drainage. If it is terraced, the slope of the pathway should be gentle so that it can be used by persons in wheelchairs and by those with canes or crutches. A handrail should be provided for a slope exceeding 1:20 and the pathway should be ramped. Cross gradients should not exceed 1:50. Steps with handrails may be provided, but only where there is also an alternative ramp route.

Walkways should be at least 1500 mm wide so that wheelchairs can be turned around.

The surface of the path is important, too. It should be firm and even. Paving block with large joints and gravel or mud paths are not suitable. The edges of pathways should be plainly marked by paving material of a contrasting texture and colour. Curbs and other raised or depressed features are not recommended.

Exterior hose connections and electrical outlets should be placed 600 to 1200 mm above the ground and should be accessible from a paved area. A storage unit for garden tools and other outdoor equipment should be provided.

A generous number of permanent outdoor benches should be provided near pathways, but not infringing on them.

Windbreaks, in the form of fencing, trees, shrubs or terraces, are necessary in many locations, particularly near high buildings. Other attractive features may be added, such as fountains, pools, birdbaths, feeder stations and bird houses.

# Entrances to the Building

A level paved area at least 1500 × 1500 mm, and sheltered by a roof or canopy, should be provided outside all entry doors and doors allowing access from parking areas. If a change in level is necessary between the doors and pedestrian or vehicular approach points, stairs and ramps should be provided.

Entrance doors to buildings should preferably be of the sliding type. If swing doors are used, 810 mm single-leaf types are preferred that are easy to open and have a slow-action door closer. The preferred door pull pressure is 35 kPa; 55 kPa is the maximum. Automatic door closers are available and are desirable if the speed of door action can be controlled. Where door handles are required, a large lever type should be used. A 300 mm high kickplate is recommended.

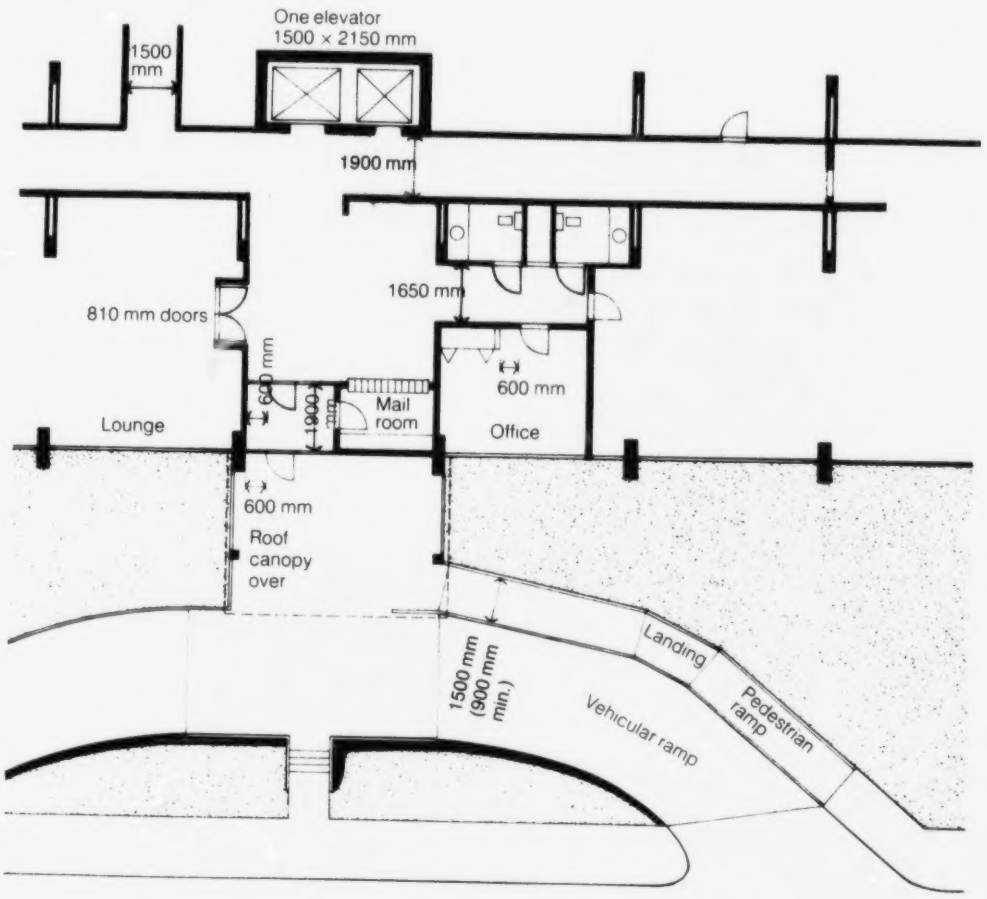
Automatic doors should have guard rails, power floor mats, push or kickplates, and a horizontal or vertical sensing device; the doors should remain fully open until the area is cleared by the user.

All glass doors should have some markings, such as a contrasting frame or hardware, to identify them as doors.

Glass doors and glass walls should have safety markings at or just below eye-level.

The vestibule inside the entrance door should have a minimum depth of 1900 mm.

Circulation in public areas



*Not glamorous, but necessary for everyday activities.*



# Circulation in Public Areas

The main consideration in the design of circulation space for disabled persons is that it should be fully and conveniently usable by those in wheelchairs. There must be adequate space allowance for manoeuvring. The basic design principles are as follows:

1. Changes in level should be avoided, but where they are necessary, ramps should be provided as well as stairs.
2. Space should be provided in corridors and other areas to permit wheelchairs to make a complete turning circle (1500 × 1500 mm).
3. There must be adequate clearance for the wheelchair user to open a door without being positioned within the arc of the door swing. A minimum space of 600 mm at the handle side of the door swinging toward a wheelchair, and an access area of at least 600 × 1500 mm, will satisfy this requirement. This area can sometimes be reduced, depending upon the direction of access (see also sketches on page 28).

The design of corridors should attempt to compensate for ambulatory and visual disabilities. Floors should be slip-resistant and lighting levels should be high. Doorways leading into separate living units should be distinguished by colour and number and should be brightly illuminated. An institutional effect can be avoided through the sensitive use of colour, texture, lighting and through the provision of windows affording a view of the outdoors.

Perception studies indicate that people react negatively to public corridors that are long, narrow and visually monotonous. Ideally, building corridors should have a minimum width of 1500 mm and a maximum length of 12 000 mm. Where the floor plan of the building requires longer corridors, they should be staggered or angled, and materials in a variety of colours and textures should be used. Where doors open out into the corridor, the width should be increased to 1650 mm. Windows offer visual variety and also augment interior illumination.

Where handrails are provided, they should be placed along both walls of the corridor, so that a person with a disabled right or left hand can use the support of either side. They should be dimensioned and textured to ensure a firm grip and should be mounted at a height of 900 mm. Tubular handrails are recommended, and they should be at least 45 mm in diameter with a 40 mm clearance from the surface of the wall. When handrails are interrupted by a doorway or opening, they should curve back to the wall at the point of termination or should provide a tactile warning about 150 mm ahead of the break. Corridor lighting also may be integrated with the handrail design.

Special features may be incorporated to serve as a guide for blind persons. Blind persons are sensitive to texture variations in wall and floor surfaces, and to the resonance of particular spaces. Wall, floor and ceiling materials, therefore, may be varied to indicate the route that the corridor follows. For example, where two corridors meet, the floor covering may be changed from carpet to wood; similarly, the end of a corridor may be indicated by a break or change in surface material. For partially blind persons, large, brightly coloured directional signals placed along the walls may serve the same purpose.

Accessible routes to emergency exits must be well marked with tactile and audible warning systems. Emergency exit door openers should also have tactile warning systems. Audible warning signals should be emitted by emergency exits during emergencies.

Colour coding to indicate directions can be frustrating to those who are colour blind; it is recommended therefore, that each colour be associated with a geometric form. In some cities, for example, traffic lights have a different shape for each colour.

# Service Facilities

Certain service facilities are normally provided in residential buildings: a mailbox area, an intercom system, a garbage chute and a laundry room. In large buildings, public telephones and washrooms may also be provided. Special consideration should be given to the design of these features to permit access and use by disabled persons.

Mailboxes should be located in the entrance vestibule where they are readily accessible. Boxes for disabled persons should be placed no lower than 600 mm and no higher than 1400 mm from the floor.

Call buttons from the vestibule to individual living units should be placed no lower than 600 mm and no higher than 1400 mm from the floor. The intercom should be of the telephone type on a flexible cord, with a telephone cradle fixed about 1200 mm above the floor, both in the vestibule and in the living unit.

For deaf persons, a closed-circuit television system may be provided to permit residents to identify visitors in the lobby. A flashing light in the dwelling unit would indicate the arrival of a visitor.

Garbage chutes should be easily accessible. Where a chute is located in a separate room, a minimum area of 600 × 1500 mm should be provided clear of the swing of the door.

Laundry rooms require generous floor space to allow turning movements of the wheelchair. Laundry machines with side-hinged, front-loading doors are desirable for easy access.

Public telephones should be located in an open booth with no door. A simple hood can provide privacy and acoustical balance. The instrument should be fixed lower than is usual: no operating part should be higher than 1200 mm and a shelf should be provided at a height of 840 mm to hold telephone directories, personal belongings and to provide support. A seat at a height of 450 mm is also desirable.

Public washrooms should have doors at least 810 mm wide with a 760 mm clear opening. Clearance around all equipment should be based upon the criteria given on pages 38 to 44. Toilets should have a lid or a permanent back rest and a grab-bar should be provided on one side (see pages 38-39). Two standard toilet compartments may be converted to this use. A properly designed compartment should include a vanity and washbasin; urinals should be floor mounted and level with the floor of the washrooms.*

Instead of modifying men's and women's washrooms, it is more useful and may be more economical to provide a single two-fixture washroom for disabled persons of both sexes. This is a logical arrangement, particularly when the wheelchair user is accompanied by a helper of the opposite sex.

The office of the resident director, superintendent or caretaker must be readily accessible. The best location probably is close to the main entrance lobby.

*These criteria are based upon those given in the National Research Council's *Building Standards for the Handicapped*.

# Social and Recreational Facilities

There are two considerations in designing social and recreational facilities intended for convenient use by disabled persons: access to facilities and the types of facilities provided. Again, convenient access to all facilities is necessary for wheelchair users, blind persons, deaf persons and persons with mobility, visual or hearing impairments.

The types of facilities included will depend upon the size of the building and the proportion of disabled persons among its occupants. In the case of a small group residence designed exclusively for disabled people, necessary economies will permit the inclusion of only a few facilities, such as a lounge and a small multi-purpose room. Where disabled persons live in a mixed-use apartment building, a wider range of facilities will be required, and their precise nature will depend upon the various needs of all the residents. Here we will discuss each type of facility in terms of the needs of disabled persons, but the needs of other possible users also should be considered.

Lounges, sitting areas, party rooms and similar spaces will be used for a wide range of activities. Since many of these will develop from the needs of the residents, the architect cannot easily predict and plan for the use of such areas. It is therefore wise to design lounges and recreation areas to permit a variety of uses. Generous storage space is an essential part of any lounge or recreation area.

In large apartment buildings, small sitting rooms are useful, in addition to a main lounge. These may not be extensively used, however, unless they are adjacent to an activity area, such as a laundry room.

In an apartment building, easy access to a restaurant or cafeteria is desirable. If a self-service cafeteria is contemplated, the design should permit wheelchair access to the food pick-up area.

Where exclusive use by a small group of disabled users is intended, the space requirements for circulation and dining are increased. The design guidelines outlined on pages 28 to 30 can be used, with a more generous allowance for circulation areas.

Workshops and activity rooms may be used not only for recreation, but also for training or as a sheltered workshop producing saleable goods. The designer is advised to determine the extent of proposed activities before allocating space for these operations.

Swimming pools, sauna baths and exercise rooms are valuable in the rehabilitation of physically disabled people. Even in cases where no improvement in physical capability can be expected, these facilities are useful in keeping disabled persons fit and active. Provision of such facilities is a specialized design problem, but some principles may be outlined.

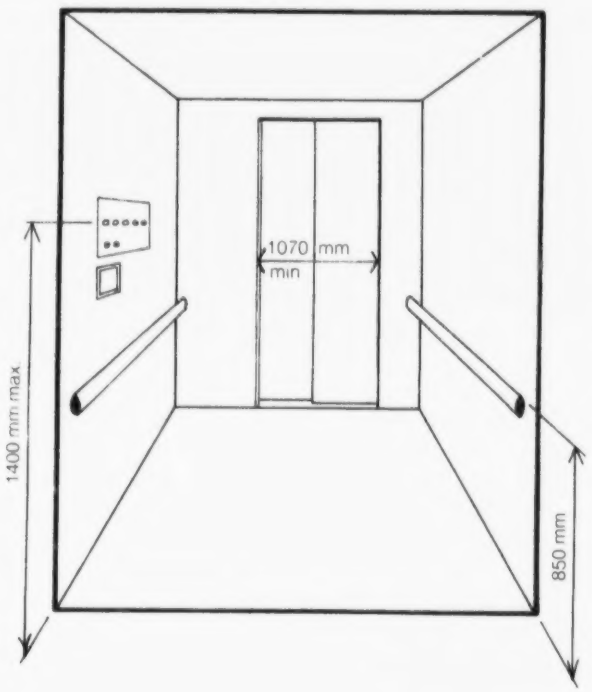
Floors should be slip-resistant and grab-bars should be provided. Special equipment for entering and leaving a pool may be required: for example, a chute, a mechanical lift, or steps with handrails. The nature of these items, which may have both recreational and therapeutic uses, must be decided by the designer in conjunction with the client. Where floors are sloped for drainage, the slope should be the minimum required.

Changing rooms should be larger than normal. Bench-seats should be provided at a height of 450 mm and should be fixed to a wall. Showers should conform to the requirements set out on pages 40 and 41.

Any facility that promotes contact with the public will help to prevent the isolation of disabled people. A shop or store on the ground floor of the building, possibly opening onto a street, may provide an outlet for goods produced in the workshop, and may serve as a corner store that is used and/or operated by residents.

A roof garden, sun rooms, or a hothouse would allow those who enjoy the cultivation of plants or flowers to do this through the year in controlled conditions. This can be important in boosting the morale of those who are confined to the building for long periods.

Elevator cab




# Elevators

Elevators are essential in multi-storey buildings used by persons in wheelchairs. They must be designed so that blind or deaf users can also operate them conveniently and safely. Safety and reliability are more important than speed. At least one elevator should be provided in buildings of two or more floors that are intended for use by disabled persons.

One aspect of great concern is the safety of disabled persons if a fire occurs. They are dependent upon the elevator for escape from upper floors, but a typical elevator installation is one of the first items to malfunction or to be shut down in this situation. For this reason, at least one elevator should be designed in accordance with Section 3.2.6.4 of the 1980 National Building Code.

In large buildings, at least one elevator should have an interior cab size of approximately 1500 × 2150 mm to accommodate a wheelchair and furniture. There should be access to a secondary building entrance from this elevator. Cabs in other elevators should be a minimum of 1200 mm deep. Handrails should be provided on three sides of the cab at a height of 850 mm. Minimum clear door opening should be 1070 mm.

A shelf for packages should be provided in the cab and in each elevator lobby. The shelf should be at least 200 mm wide by 400 mm long, mounted at a height of 760 mm. A fold-down shelf may be used. Since this shelf also may be used as a temporary resting place, the attachment should be designed to support a 100 kg load.

If the building is in an area where elevator repairmen are not quickly available, a manual lowering device should be provided which can be operated safely by building maintenance personnel.

Control buttons inside and outside the cab should be arranged horizontally not more than 1400 mm above the floor and preferably at least 400 mm from any corner. The inside control panel is best located on the side wall of the cab; ideally, on both side walls. Floor numbers on the panel should be raised or in braille so that they can be felt by touch. Audible information signals are recommended. There should be a voice-intercom system connecting the elevator cab with an alarm bell and receiver located in the manager's office or in the lobby. Lighting levels should be at least 50 lx at floor level.

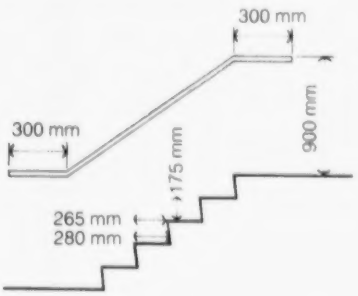
Elevator doors should remain open for at least five seconds and should close slowly. Elevator equipment should be chosen which permits regulation of the speed of the elevator, of the time the door remains open, and of the door-closing speed. A quick-response photoelectric sensor and rubber bumper guards should be used.

Floor levels should be indicated by raised letters on the door jamb just below eye-level.

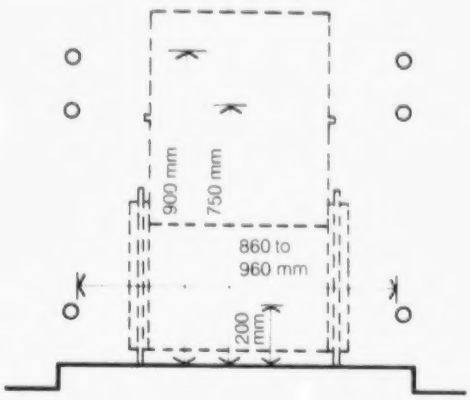
*Used by the ambulatory disabled, except in case of fire when they are used by all.*



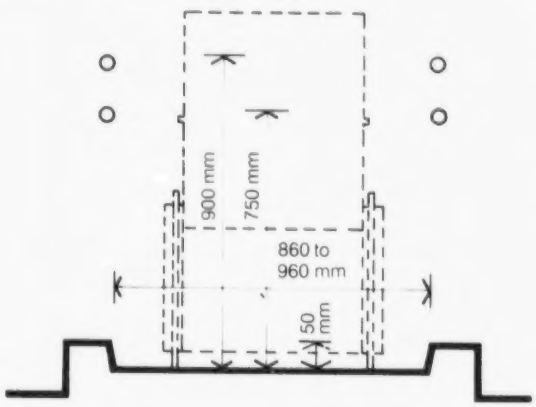
Recommended stair details




Ramp section showing lower rail




Ramp section showing curb detail




# Public Stairs

Where a change of level is unavoidable , a ramp or stair may be used. Because not all disabled persons prefer or need to use ramps, both stairs and ramps should be provided.

Stairways should consist of a short, straight flight, with a minimum of three risers and a maximum of ten risers per flight. Steps should have plain faces with no projecting nosings or open risers.

Tread dimensions should be a minimum of 280 mm in depth with a minimum run of 265 mm. Riser dimensions should not exceed 175 mm. A minimum stair width of 1120 mm is recommended.

Treads should be non-slippery with either an abrasive surface or inset abrasive strips. A soft plastic nosing of contrasting colour should be used over carpeting. For other stair finishes, treads and risers should contrast in colour to eliminate visual confusion.

Handrails should be provided on both sides of stairs at a height of 900 mm above the nosing. If the building is to accommodate elderly persons, the height should be reduced to 840 mm. Handrails should extend at least 300 mm beyond the last step in a flight and should be continuous along landings. Tubular handrails, with a diameter of at least 45 mm, are recommended to provide a firm grip. Endings of handrails should turn inwards or downwards so there will be no hazardous projections.

# Public Ramps

Ramps are required for all disabled persons in wheelchairs, and may be preferred to stairs by those with other limitations. They are essential in all buildings intended for use by disabled persons.

In regions with severe winter weather, exterior ramps should be covered or serviced by a snow-melting system. If these requirements cannot be met, arrangements should be made for thorough and immediate removal of snow and ice.

A curb 50 mm high, or a guardrail mounted at a height of 200 mm above the ramp deck, should be provided to prevent wheelchairs from slipping over the edge.

If a change in level is necessary, a gradient of 1:20 is preferred, but slopes of 1:12 may be used for a maximum length of 9000 mm. A steep ramp of 1:8 for a 2500 mm distance may be used indoors but should be avoided if possible.

*Absolutely necessary for wheelchair users.*

*Easy individual control essential, because of the differing personal requirements.*



Upper ramp landings should leave an area of 600 × 1500 mm free of door swings. Lower ramp landings should be a minimum of 1800 mm long. Intermediate landings 1200 mm long should be spaced at 9000 mm intervals along the ramp and at points of directional change.

An unobstructed width of 850 mm to 1015 mm between handrails will allow a person in a wheelchair to use both hands for movement. This width should be used where gradients exceed 1:12.

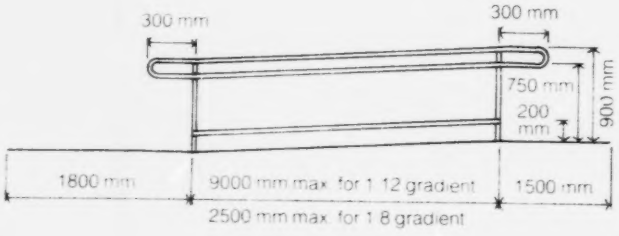
Ramps should be equipped with handrails, to provide support for ambulatory and semi-ambulatory persons and for wheelchair users. Two sets should be provided: one at a height of 900 mm and one at 750 mm.

Handrails should extend a minimum of 300 mm beyond the end of the ramp. Tubular handrails are recommended and should be 45 mm in diameter to ensure a firm grip.

Ramps should have slip-resistant surfaces. The points at the top and bottom of the ramp, where it meets a level surface, should be smoothly graded and unbroken in structure and surface covering. Tactile strips or a texture should be used to identify the bottom and top of a ramp so that a blind person will be alerted to the danger of cross traffic.

Doors to stairways and ramps should have tactile lettering for identification. A faint buzzer or vibration point for deaf and blind persons would be useful.

Recommended ramp details




# Heating, Cooling and Ventilation

Disabled persons make special demands on their physical environment. Some tend to be sedentary and many spend a considerable amount of time in their living unit. Those who are semi-ambulatory or confined to a wheelchair expend a great deal of energy in performing everyday tasks and are likely to perspire heavily and frequently; they may therefore experience some discomfort if the air around them does not circulate freely. Elderly disabled persons, in particular, are susceptible to respiratory ailments.

Consequently, it is important that disabled persons can personally control the temperature, ventilation and humidity in their home. The heating system should be capable of operating at a normal temperature of 24°C, rather than the usual 22°C.

In regions where the summers are hot, an air cooling system should be provided, particularly for small apartment units with no cross-ventilation. In regions where winters are dry, a level of at least 25 per cent relative humidity should be maintained.

There should be no drafts in a building that houses disabled persons. Extra care should be taken in caulking and sealing windows and doors. Sliding doors are not acceptable as the only source of fresh air to a room, because they cause drafts when open.

Radiators and all heating pipes should be enclosed because many disabled persons lose the sensitivity of their skin to direct heat. In bathrooms, a ceiling-mounted supplementary source of radiant heat should be provided (see page 44). Where forced-air systems are used, they should be provided with efficient and well-maintained filters and with low-velocity diffusers.

# Fire Safety

Safety from fire is especially important for disabled persons because they are unable to move quickly and freely and may be unable to use normal escape routes. These problems are compounded in high-rise apartment buildings, where even physically agile persons may be trapped if the elevator system breaks down or if smoke infiltrates into emergency stairwells.

Part 3 of the National Building Code of Canada , 1980 contains requirements for high buildings in recognition of the special problems of fire safety that are found in such buildings. In addition, recommended provisions to control smoke movement have been issued in pamphlet form by the Associate Committee on the National Building Code.*

*These documents may be obtained from the Secretary, Associate Committee on the National Building Code, National Research Council, Ottawa, Canada K1A 0R6.

Although the special measures described in these documents will improve fire safety, the special case of housing for disabled persons in multi-storey buildings should be fully discussed with the local authorities. The safest location for individual dwelling units for disabled persons is undoubtedly on the ground floor, but some of them may not wish to live there. In any case, efforts should be made to locate these units on the lower floors of high-rise buildings, and the local fire department should be told which apartments are occupied by disabled residents. The effectiveness of fire safety installations within the building will be undermined if fire trucks cannot reach all sides of the building which have windows, balconies and evacuation points. Clear and unobstructed fire access routes are vitally important, and it is essential to consult local fire-fighting authorities immediately.

Where disabled persons are housed on floors above the first storey, the following measures are recommended:

1. Under the National Building Code, section 3.2.6.9, a voice-communications system is required in residential buildings that are more than 36 m in height. Where many disabled persons are expected to be housed, this requirement is recommended to include residential buildings with more than one floor above ground level.
2. Balconies should be used as a supplementary refuge area and as an escape point where fire-truck ladders can be provided. Equipment limitations restrict the usefulness of this measure to a maximum of about nine floors. Balconies may be individual or may serve a group of units (see page 45).
3. Smoke and heat detectors should be installed to comply with local fire regulations and bylaws. Smoke detectors should be provided in each unit, connected to a central alarm terminal.

# Alarm Systems

High rates of sickness and accidents among disabled people indicate the need for an alarm system, particularly where they live on their own. The disabled person may easily fall, hurt himself, or become ill and helpless without anyone knowing. An alarm system connecting each dwelling unit to a central control point is therefore recommended in new construction.

There should be two terminals of an alarm system in the dwelling unit, well marked for day-time use and illuminated so that they can be seen at night. One should be located in the bathroom, because many accidents occur there, and the other in the bedroom. If only one alarm button is provided it is preferable to place it in the bathroom. Buttons or pull cords should be placed no more than 600 mm above floor level, so that they can be reached from a prone position. An alternative to the mechanical push-button alarm is one that is triggered by a whistle carried by the disabled person, or by a frequency modulator.

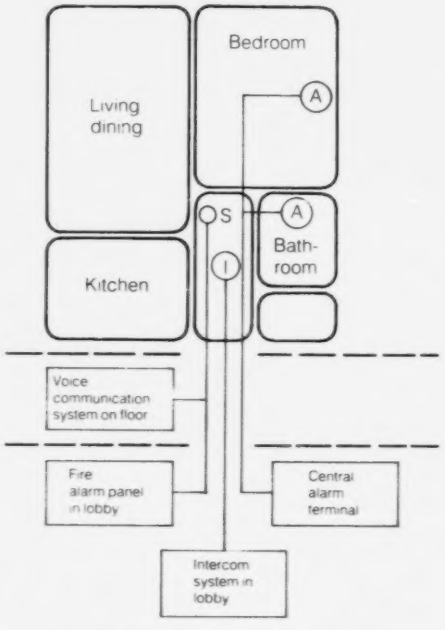
Where the dwelling terminal should be placed is determined by the audible range of the whistle. For deaf persons, a flashing light may operate when the fire alarm system is triggered. For further and more immediate night-time warning, a vibrator device may be used.

The location of the central terminal varies according to local conditions. If it is placed in a superintendent's apartment it should be heard at any time of the day or night.

Another possible location is the lobby or vestibule, where the system can be combined with the intercom system or perhaps with the fire voice-communications system terminals.

A third alternative is to employ a telephone switchboard, using a telephone alarm system, but this solution is practicable only when staff is provided around the clock.

Alarm Systems




S — Smoke detector

A — Alarm system

I — Intercom

*"So-called architectural barriers often frustrate the best-laid plans for the future."*

G. Gingras

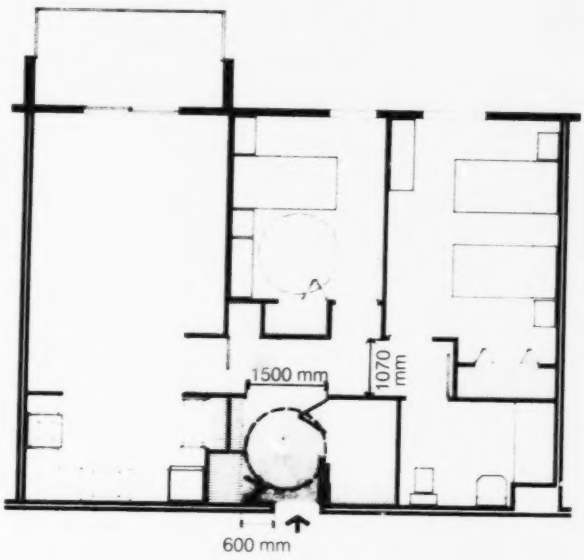
# 3 Desirable Criteria for the Dwelling Unit

*A high standard of design in the individual dwelling unit pays off in the long term.*



In a residential group home, or in an apartment building where a proportion of the units are designated for occupancy by disabled persons, the individual dwelling units should be designed for easy access and comfortable use by persons with a wide range of physical disabilities. Here, again, the need to accommodate a wheelchair imposes the most stringent requirements on the design and use of space. Most of the advisory design criteria in this section can also be applied to the renovation of single-family houses.

Circulation inside the dwelling



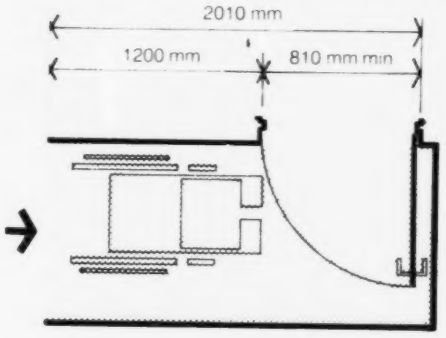

# Circulation and Doors

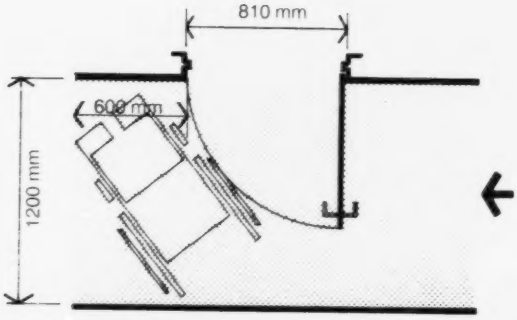
An entry hall measuring at least 1500 × 1500 mm, clear of door swings, should be provided just inside the door leading from the corridor to the apartment unit, to permit a complete turn in a wheelchair and to allow sufficient space for the removal of outdoor clothing.

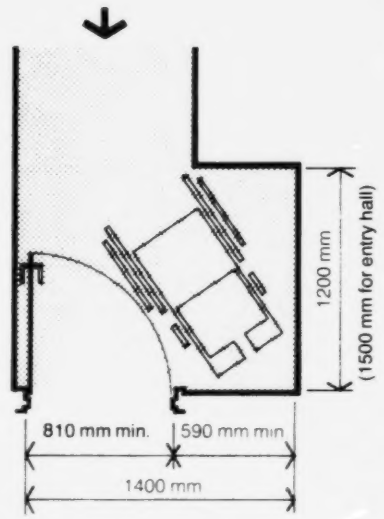
Corridors in the dwelling unit should be at least 970 mm wide, but a width of 1070 mm is preferred, to allow space for the installation of a handrail or to accommodate an outswinging door. This should be increased to 1200 mm where an outswinging door may be approached from the hinged side.

Doors within the apartment unit may be of several types. The common hinged door is economical, but hard to manipulate and wasteful of space. Bifold and accordion doors are easier to use, but are not appropriate for entrance doors. They are usually too fragile to withstand daily abuse by wheelchairs. Sliding doors are easy to operate and occupy little space. Whatever type of door is chosen, it must satisfy certain requirements to be useful in a unit for a disabled person:

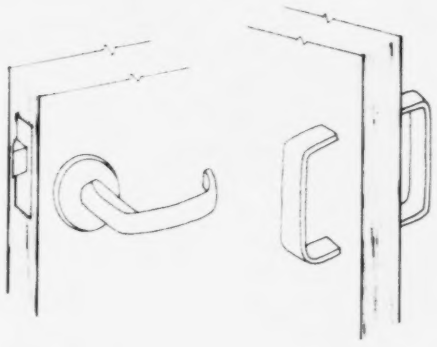
Space requirements for approach to outswinging doors



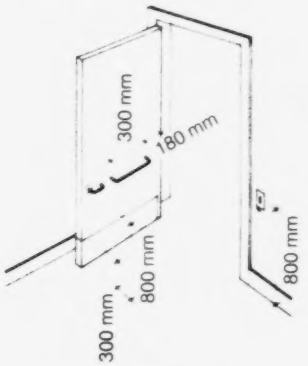






Lever and 'D' type door handles

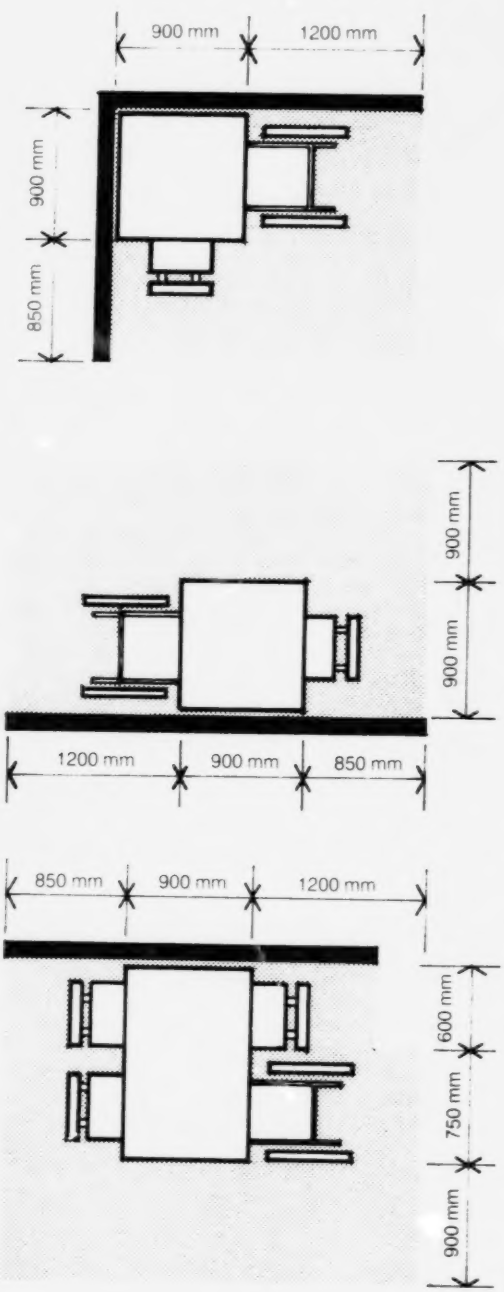


Typical interior door showing kickplate, adjacent light switch, and fixed pull handle




1. The door must be wide enough to permit clear passage of a wheelchair. The minimum clearance of 750 mm requires an 810 mm hinged door. Where it is impossible to have a generously wide corridor in the unit, the door size should be increased to compensate for the difficulty in turning. For entry doors a width of 860 mm is recommended.
2. The wheelchair user must have enough space to manoeuvre into position to open the door. The amount of space required depends upon the direction of approach and the type of door, but it is critical when approaching a hinged door which swings towards the user. An area 600 × 1200 mm clear of door swings is the minimum required in this case. For bifold doors, this area can be reduced to 450 mm and in the case of sliding doors or inswinging hinged doors, no additional clearance is required.
3. Thresholds should be eliminated wherever possible; and where required, a low profile with bevelled edges should be used.
4. Door handles must be easy to grasp. Large lever handles are preferable, and handles should be angled or cornered so that they do not catch on clothing. The recommended height is 750 to 900 mm above the floor. To make it possible for a person in a wheelchair to close an outswinging door from the inside, a fixed handle should be provided about 180 mm from the hinged side or a horizontal grab-bar set at a height of 750 to 900 mm. Heavy-duty grab-bars are not required here. Door-closing equipment of this type should be installed on bedroom and bathroom doors, and elsewhere in the unit wherever the individual tenant wishes.
5. A hinged door that is left open may obstruct the use of a room. Therefore, if one is used for the bathroom, it should swing outward to permit maximum use of the space in the room.
6. Door numbers at unit entrances should be placed at a height of 1200 to 1350 mm above the floor. Raised screw-on numerals should be used, rather than painted numbers, so that persons with failing eyesight can identify them by touch.
7. It is recommended that an emergency data card be provided on the inside of the entrance door to the unit. This should list the telephone numbers of doctors, the fire department, the building superintendent and helpers of the disabled person. A listing of this type is useful for the resident and also for anyone called in to help in an emergency.

Area required for various dining arrangements




# Living and Dining Areas

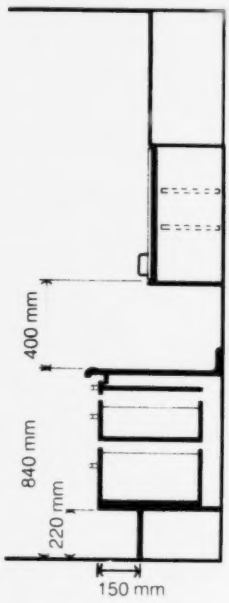
Living rooms require little modification, but the size should be increased beyond the minimum to allow manoeuvring and "parking" space for a wheelchair. Recommended design features for windows are described on page 46.

The floor space in the dining area also should be increased to permit wheelchair use. Clearance of 900 mm between walls and furniture should be allowed for circulation, and an area 750 × 1200 mm should be provided for the space occupied by a wheelchair at the table. If there is a separate dining area, it should be directly accessible from the kitchen. A hatch is desirable between the two rooms, linking the kitchen counter directly to the dining table. Or perhaps a trolley may be used for serving meals.

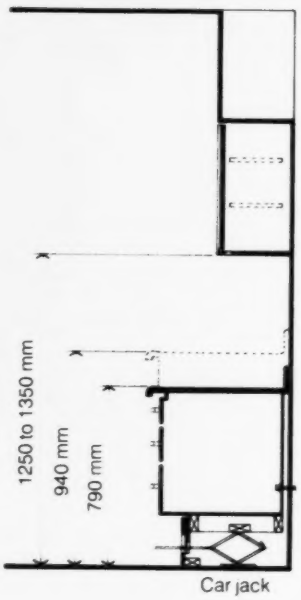
*A problem of space and accessibility.*
*Since no single solution will suit all users, compromises must be accepted or flexibility built in.*



Kitchen type "A"




Kitchen type "B"




# Kitchens

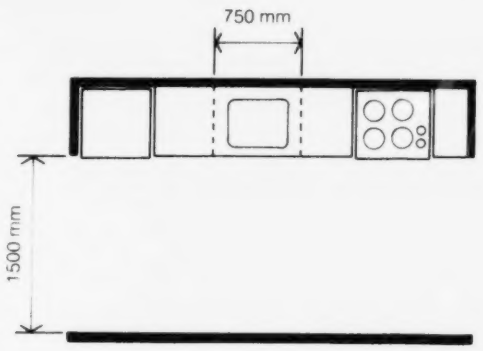
To design a kitchen that will be used by persons with various physical disabilities presents complex problems for the designer. A kitchen ideally suited to a wheelchair user may not be ideal for someone with a different disability, and may be very inconvenient for an able-bodied relative or friend of the disabled person. Some of the requirements of these individuals — the height of working surfaces and equipment, for instance — are incompatible.

Two alternative approaches to kitchen design may be considered. First, a series of compromise heights may be developed that will not be ideal for any particular user but will be usable by all. This approach (kitchen *A*) allows for standard methods of construction, with little or no increase in costs. Second, a system may be designed that allows limited flexibility in the height of the most important component, the counter (kitchen *B*). A third alternative is a completely flexible, mass-produced system, such as the Fokus kitchen developed in Sweden. This system can be adapted to all needs but is the most expensive solution and will not be considered in detail here.

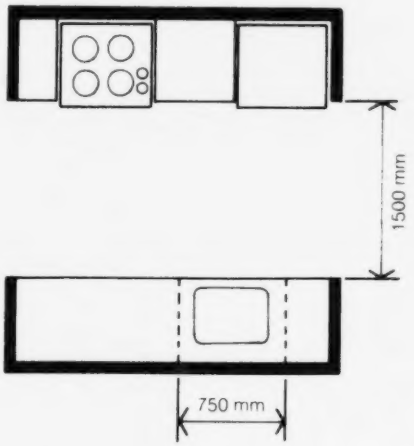
In kitchen type *A*, a fixed counter height of 840 mm is recommended. This is particularly useful where the kitchen is used by both disabled and able-bodied persons. Standard equipment may be used for all items except the range, which must be lowered by 75 mm so that it is level with the surrounding work surface. A built-in range which lacks a bottom storage section, is easily modified for this purpose. Another alternative is to build in countertop burners and a separate oven, but this is expensive and also requires the provision of additional counter space.

Kitchen *B* is based upon the principle of limited flexibility of counter heights. The idea was developed at Canada Mortgage and Housing Corporation, and a test kitchen has been constructed at the Royal Ottawa Hospital. The system can be adjusted to suit persons with various disabilities or can be left at a standard height. The intention is not to adjust the height daily, but rather to set a suitable height for a particular occupant.

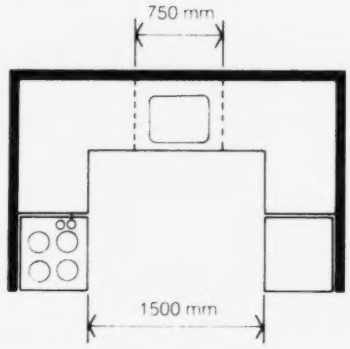
In-line kitchen




Galley kitchen




U-kitchen




L-kitchen

In the test kitchen, the counter is moved up and down from a height of 790 mm to 940 mm, by means of standard car jacks that are stabilized by a sliding track at the rear of the base cabinets.

The range is similar to the one used in kitchen *A*, except that the base is completely removed and the unit is mounted on jacks.

In the test kitchen, no counter cupboards are provided under the sink counter, necessitating a special detail for vertical movement. Base cupboards can be used with the normal jack detail, provided a minimum width of 750 mm is left under the sink for knee space 660 mm high.

Plumbing is a special problem in a movable system. Flexible connections must be made for hot water, cold water and waste, assuming that this is permissible under local building bylaws.

**Kitchen Layout Types** The layout of the kitchen is often dictated by the overall planning of the residential unit, but it is useful to understand the basic advantages and disadvantages of the various alternatives. For all plans, a 1500 mm clear space is required between solid counters or immovable pieces of equipment.

The in-line kitchen does not provide a convenient grouping of facilities and equipment, but access is possible to all storage space and equipment.

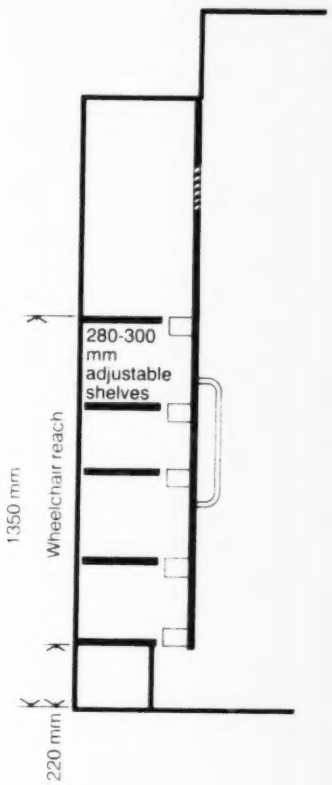
The open-ended corridor or galley kitchen provides ready access to all equipment but separates the main work surface and the sink from the cooking and storage units. This means that food and utensils have to be carried from one counter to the other, an arrangement that increases the risk of spills and other mishaps. It is difficult to include a pantry cupboard in this layout.

The U-shaped kitchen concentrates the work areas and equipment, making it easy to move utensils from one surface to another. The disadvantages of the arrangement are that lower counter storage space at the two internal corners is difficult to use; and a pantry cupboard can be included only if one leg of the U is extended.

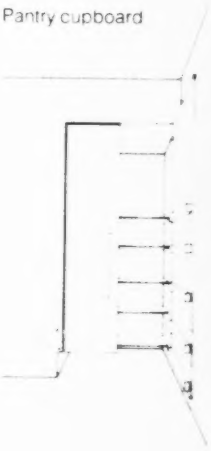
The L-shaped kitchen provides convenient access, concentrates work functions, and has only one internal corner. It satisfies most people's needs and fits into most plan types. A pantry cupboard can easily be included. If the internal corner under the kitchen counter can be opened into an adjoining room, this space becomes a readily accessible storage cupboard. It may be made accessible in the kitchen by using a lazy-susan.

Whether or not the living unit contains a separate dining area, the kitchen should be large enough to include some dining space. A breakfast table or an extension of the counter may serve this function.

Section through pantry cupboard




Pantry cupboard



## Counter and Base Cupboards

Kitchen counters should be continuous, at a uniform height and level with countertop burners or the top of the range. The counter surface adjacent to the range or burners should have a heat-resistant covering, such as ceramic tile. There should be a splash-back at the rear of the counter, and the front edge should have a raised lip to contain spillage. A finger-hold provided under the lip is useful to the wheelchair user to pull himself close to the counter. Alternatively, a sturdy towel bar may be fixed to the cabinet face just below the counter.

Knee space under the counter is desirable, especially at the sink, to allow a wheelchair occupant full use of the counter area. The space should be at least 660 mm high and 750 mm wide. A width of 900 mm is preferable.

Drawers on roller guides should be provided to store things under the counter. The fixed shelves that are normally provided are almost totally inaccessible from a wheelchair. A recessed toe space 220 mm high and 150 mm deep is required for all base cabinets to accommodate a wheelchair.

Below-counter storage units on casters are very useful in lieu of drawers. These may be moved out for easy access or can be pulled out completely to provide knee space under the counter.

Extra storage space may be needed for a wheeled trolley, used to carry dishes between the dining area and the kitchen.

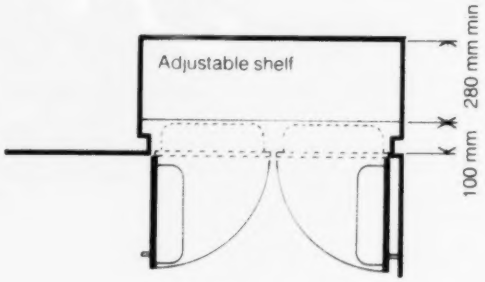
In corner cupboards, a revolving shelf may be installed, or access to the space may be provided from an adjoining room.

Pull-out chopping boards or lapboards are very useful and several should be provided, preferably at a height of 750 mm. Where two or more lapboards are provided, one should contain a hole about 200 mm in diameter, to hold a mixing bowl.

## Pantry Cupboards

Overhead cupboards are of limited value to a wheelchair user. For this reason, a full-height pantry with adjustable shelving is recommended. Narrow shelves should be installed on the inside face of the doors for ready access.

Pantry cupboard layout



**Overhead Cupboards** The usefulness of overhead cupboards depends upon the disability of the resident. If the unit is shared by able-bodied friends or relatives, or if the disabled resident is ambulatory, they are very useful. The maximum angled reach from a wheelchair is about 1350 mm — roughly to the height of the lowest shelf. At least one cupboard should therefore be included that has one shelf at a height of 1250 to 1350 mm. Cupboards should not be placed over a refrigerator or sink, and should never be placed over a range. Narrow shelves mounted on the back of cupboard doors are very useful.

Since the upper kitchen cabinets are only partially accessible to persons in wheelchairs, an open shelf should be provided below these cabinets.

**The Sink** The sink should be stainless steel, preferably with a double bowl. It should be about 125 to 150 mm deep, so that a seated person can use it in comfort. This type of sink can be made to order for a small increase in cost.

Knee space should be provided under the sink to a minimum height of 660 mm and a minimum width of 750 mm. This can be done in existing kitchens by replacing cupboard doors with a curtain and by cutting the floor of the cupboard back at least to within 150 mm of the back wall. To avoid obstruction by the waste pipe, the trap should be located close to the rear wall. The bottom of the sink should be insulated to prevent burns to knees and legs. As a safety device for persons whose skin is insensitive to heat, a central or individual thermostatic control may be installed that limits hot water temperature to about 46°C. Lever faucet handles should be used; a single lever operating a mixing valve is particularly desirable.

A 250 mm open shelf should be provided under the sink at a height of 380 mm from the floor.

**The Stove** The stove is a potential source of danger, but most hazards can be eliminated by careful consideration of the user's limitations.

As mentioned earlier, the cooking top should be at the same level as the counter to prevent hot pans being upset. Burner and oven controls should be at the front or the side of the stove, so that the user does not have to reach over hot burners to operate them. Gas stoves are not recommended for use by elderly persons because the sense of smell often diminishes with age. A side-hung oven door will reduce the possibility of burns, but this type is not easily obtained.

Several additional features can increase the safety of the stove. Controls should include light indicators and large, easily turned knobs. The knobs should have raised markings as an aid to those whose vision is impaired. In a family unit, there should be a master switch for the stove at a height of about 1350 mm to reduce the danger of children playing with front-mounted stove controls. An adjustable mirror may be fixed on the wall above the stove, to allow the wheelchair user to see into pans on the top burners without removing them. The mirror should be removable for frequent cleaning.

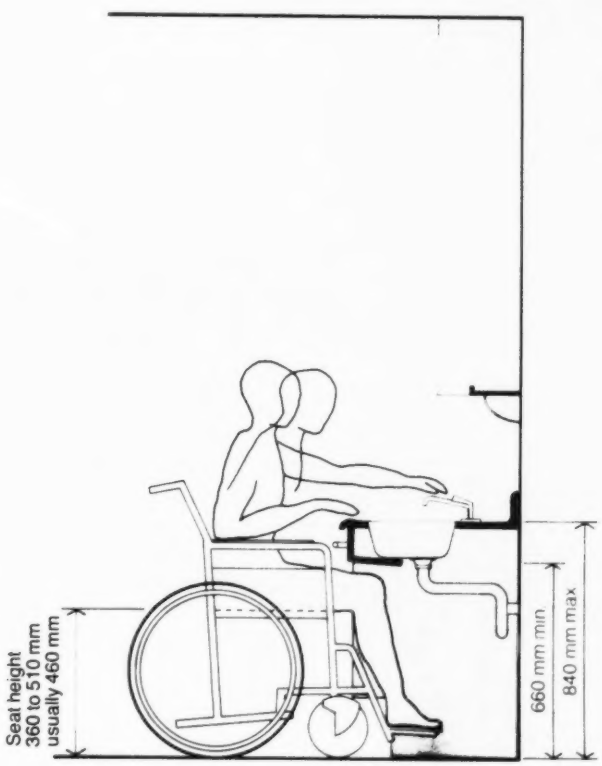
**Other Appliances and Equipment** Any standard model refrigerator with a top or side-hung freezer compartment door is acceptable. The type with a side-by-side freezer-refrigerator arrangement is the most accessible. Automatic defrosting reduces the dependence of the user on outside help.

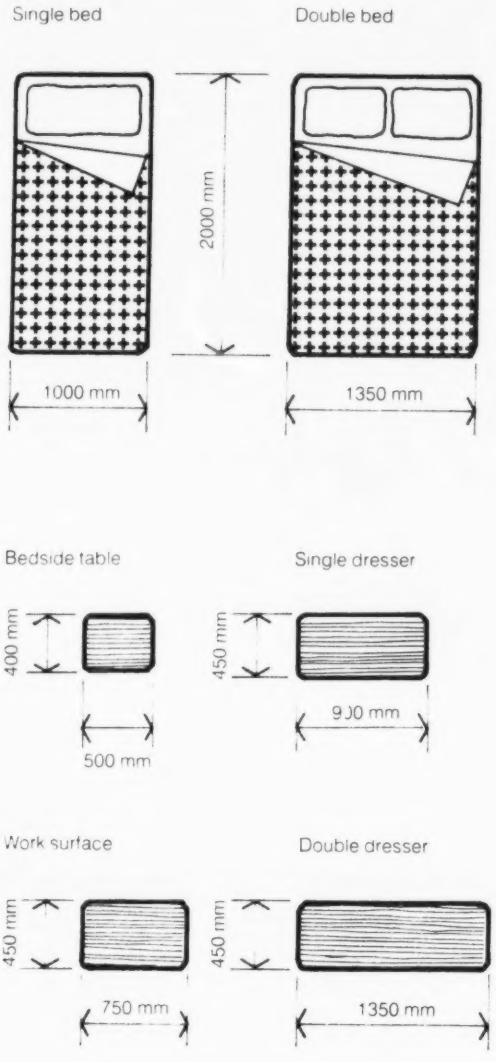
A garbage disposal unit and a dishwasher are two items which are costly, but which are highly convenient for disabled people. In both cases, controls should be mounted close to the front of the counter, and the dishwasher should be a front-loading type.

All cupboard, drawer and door hardware should be larger than usual and of the lever or bar type. The space between the handle and the drawer or door face should be 40 mm and the minimum length should be 100 mm.

Wall or cabinet-mounted strip lighting is recommended since it throws direct light on the working surfaces. This type of light is particularly important over the sink area.

Section through kitchen sink






# Bedrooms

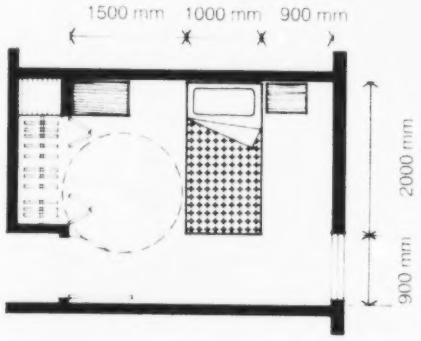
In one-bedroom units, the bedroom should be generous in size, allowing for the use and storage of a wheelchair. In a multi-bedroom unit, where the disabled person may be either an adult or a child, the secondary bedroom should be enlarged. Access to a bathroom should be direct and convenient. Where space and money permit, direct access to a second specially designed bathroom is desirable.

Clearances around beds are based on the need for a 1500 × 1500 mm wheelchair turning area on one side of the bed, a comforable clearance of 900 mm where access or circulation by wheelchair is necessary, and a minimum clearance of 750 mm in other areas. The accompanying sketches of furnished bedroom units are intended to be suggestions only. Many variations are possible using the recommended clearances.

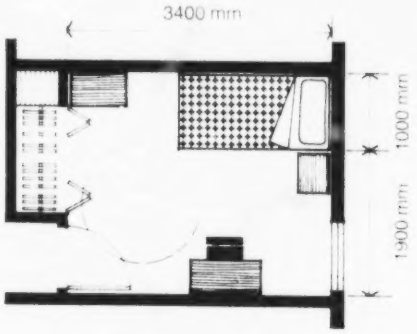
For people who are confined to their bed for extended periods of time, certain equipment controls may be needed; these should be placed within easy reach. Such controls may be provided for a telephone, a radio, a television, a two-way intercom system to the entrance with a remote control unlocking device for the front door, an emergency alarm button to alert the superintendent or a neighbour, and light switches for the bedroom and the bathroom.

A mobile trapeze fixed to the head of the bed is preferred, unless a ceiling mounting is needed for a particular occupant. A permanent ceiling eyebolt designed to hold a trapeze is not recommended, since it may inhibit future changes in furniture arrangement—in particular, the location of the bed. Ceiling eyebolts must be fixed to a structural element and have a minimum load capacity of 140 kg.

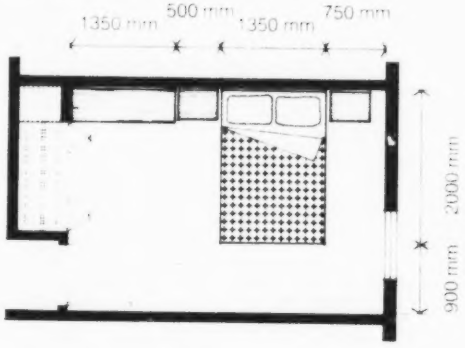
Suggested dimensions and clearances for a one-person bedroom



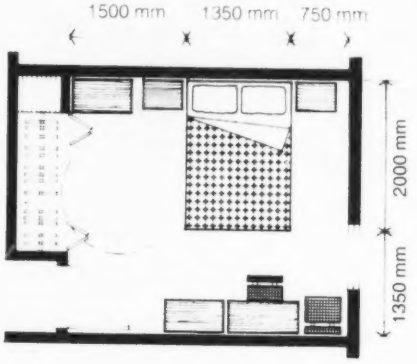

Alternative furniture arrangement in the same room



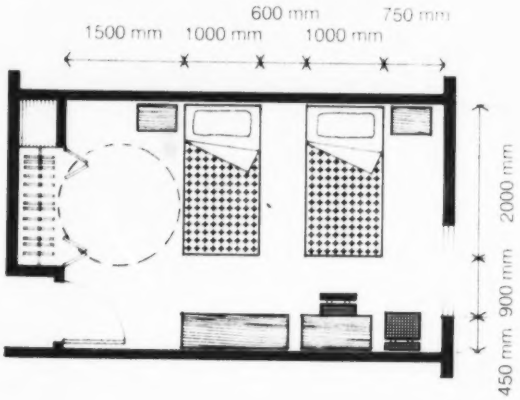

Bedroom for two persons in double bed



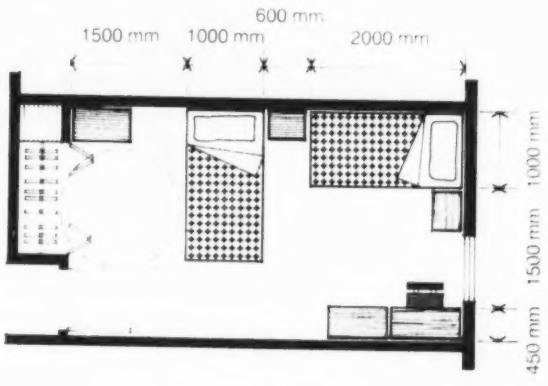

Bedroom for two persons in double bed — preferred room shape




Bedroom for two persons, including one disabled person in a twin bed



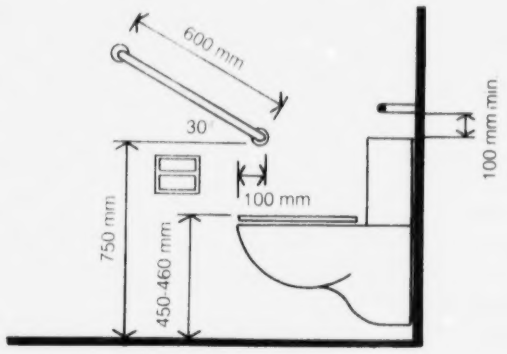

Bedroom for two disabled persons in twin beds



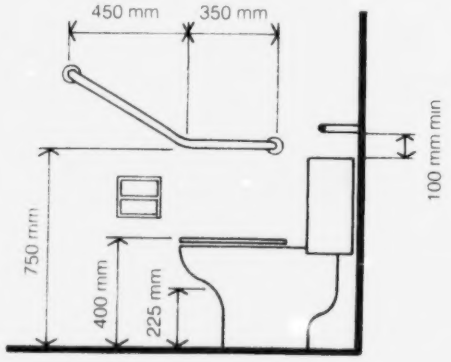
*A bathroom exclusively designed to accommodate one disability may be unsuitable for others.*



Cantilever type toilet mounted at seat height of 450 to 460 mm




Conventional toilet. Recommended grab-bar type




# Bathrooms

Conventional bathroom design can present many hazards. Elderly or disabled persons may slip easily on the hard, smooth surfaces of the bathtub or floor. If they have lost the feeling in their hands, arms, or legs, they are susceptible to burns from exposed hot water pipes or from the water itself. The most common problems, however, are impeded access because the door is too narrow, the great discomfort caused by lack of space for the manoeuvring of a wheelchair, and the absence of grab-bars to permit safe and comfortable use of the bathtub and toilet by all of us.

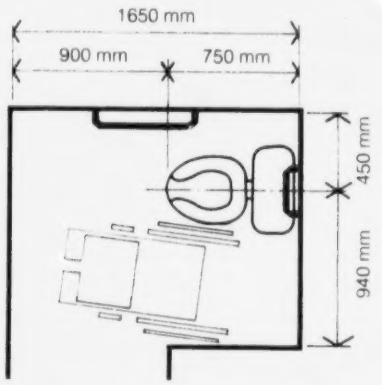
It is possible to design a bathroom to accommodate most disabilities and to reduce these hazards substantially. The following recommendations for bathroom facilities do not include specialized requirements for individual disabilities. For example, when the wheelchair user is assisted by a helper, the amount of space allowed must be increased even further. They do, however, provide reasonable conditions of comfort, safety and convenience for most disabled persons.

In households with two bathrooms, it may be appropriate to retain a conventional main bathroom for family use and to modify the second bathroom for use by the disabled person.

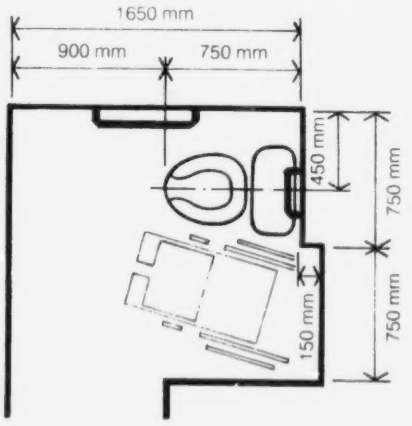
To accommodate the wheelchair user, the bathroom must be designed to make it possible for that person to pass through the door, manoeuvre beside or in front of the toilet, beside the bathtub or shower and in front of the washbasin. In some cases, the bathroom also must provide space for storing a portable toilet chair, a portable hoist and/or a portable bath chair.

Some of the extra space required may serve more than one purpose. For example, the hoist or toilet chair may be stored in an area beside the toilet; this area also may be used for lateral transfer to the toilet from a wheelchair.

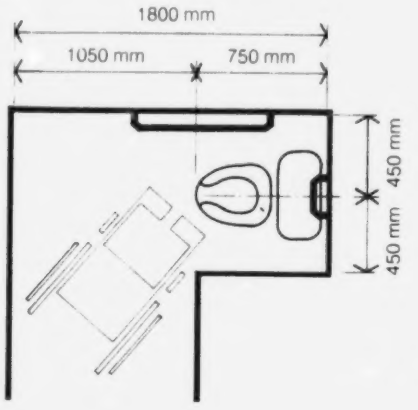
Minimum access area for side entry




Preferred access area for lateral transfer




Required access area for angled front entry




## The Toilet

The toilet must be easy to use, since disability often occasions the need for frequent visits to the bathroom.

The most convenient toilet is the wall-hung type with an elongated bowl or a toe space 225 mm high at the front. A heavy-duty toilet seat, cover and fixing bolts should be provided to allow for the uneven distribution of weight when a disabled person transfers from the wheelchair. The seat should have an open front design for ease of access.

Although the desirable seat height for most handicapped persons is often given as 450 mm to 510 mm from the floor, a standard height installation with a separate and removable seat attachment is a more flexible arrangement in dwellings where able-bodied persons share the bathroom. A toilet chair may be used too and it may serve as a shower chair as well.

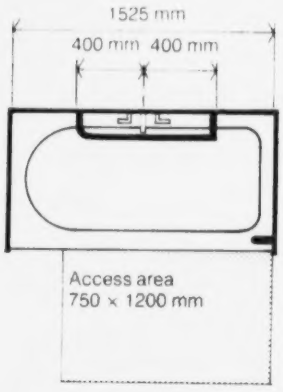
There should be a clear space, measuring 750 mm in width, at one side of the toilet to allow for lateral transfer from a wheelchair to the seat; the space in front of the toilet should measure about 1050 mm to permit a frontal approach. Ideally, the user should be allowed a choice between the two types of access. Where space for lateral transfer only is provided, the left or right "handedness" of a disabled person may be a problem. This can be overcome by providing space on both sides; but this is an expensive solution and may be difficult to achieve within the limitations of the plan of the unit. It also complicates the design of grab-bars.

The toilet should be so placed that the space from the wall behind it to the back of the seat allows the positioning of a wheelchair for lateral transfer. If the toilet seat cover or the water tank do not act as a back rest for the user, some other form of back support must be provided. Persons who cannot use their legs for support or balance must have a support for their back.

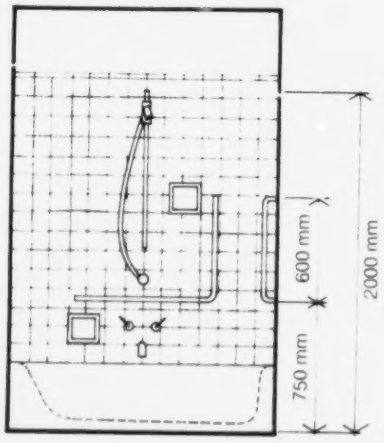
Grab-bars behind and on one side of the toilet are necessary. Space should be provided also for the installation of an additional grab-bar, since many ambulant disabled persons need support on two sides of the toilet.

The toilet-paper dispenser must be placed within easy reach. The old-fashioned style of holder that is not recessed is preferred by people with coordination difficulties and can readily be relocated to suit the needs of a particular individual. The best position for normal use is beside the toilet and about 250 mm in front of the edge of the seat.

Plan of bathtub




Bathtub elevation




Note: Many wheelchair users cannot reach taps across the tub and will need taps at the end, in which case, long lever handles may be required

## The Bathtub

The following requirements for bathtubs are based on the availability of mechanical aids, such as a portable bathtub seat or a portable hydraulic lift.

There must be sufficient space beside the tub to make it possible to manoeuvre a wheelchair or hoist into position. Grab-bars should be provided to assist both ambulatory disabled persons and wheelchairs users. Grab-bars are essential in transferring from crutches or a wheelchair to the bath seat, in transferring from the seat to the tub, in pulling up to a standing position to take a shower and in maintaining a secure standing position.

A raised tub and high rim are expedient if the disabled person needs assistance in bathing, so that the helper will not strain his or her back. This can be achieved by raising the floor about 100 mm under the tub. However, a standard tub with a 400 mm rim and non-slip bottom can be used by most disabled persons.

Faucet and drain controls (of the lever type) should be easily accessible from a sitting position in the tub. A thermostatic mixing valve is strongly recommended to prevent scalding.

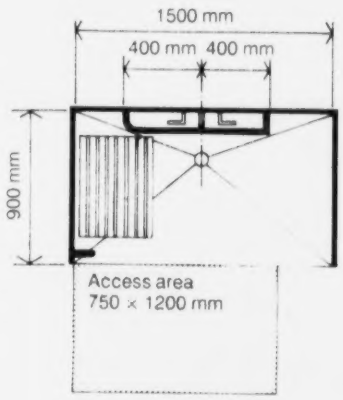
Two recessed soap-dish units should be provided, one mounted low for use from the bath and the other set at a height of about 1200 mm for use while taking a shower. A hand-held, flexible, cable-hose shower unit should be provided, too, set on a sliding mount. Shower curtain rods should be of heavier-than-normal construction. Sliding shower doors should not be used.

## The Shower

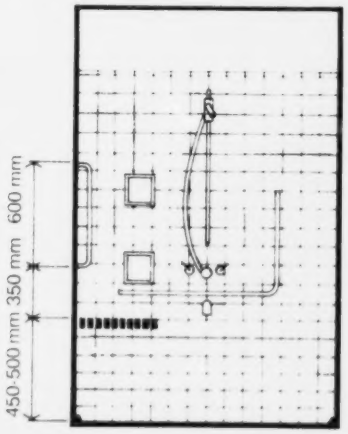
Many disabled persons prefer a shower to a bath. The wheelchair occupant can use it without assistance and it is hygienically preferable to a bath. Standard manufactured units are available; but because of their small size and the relatively high curbs with which they are equipped, they may be unsuitable for disabled persons.

The recommended shower is a built-in unit, with a floor that is a continuation of the bathroom floor. A low 20 mm threshold is sufficient to prevent water spillage and the floor within the cubicle is sloped slightly towards a drain. A minimum area of 900 × 1500 mm is recommended, with a clear access width of 750 mm.

Plan of shower




Shower elevation




A shower seat is essential. This may be a portable or cantilever type. An L-grab-bar helps in rising from the seat and ensures stability while standing. A vertical grab-bar also should be provided to assist the user in transferring from a wheelchair to the seat. A telephone type shower should be provided, with a bath spigot for testing temperature. Faucet controls should be of the lever type.

The shower design can be reversed, depending upon the "handedness" of the user. Installation of the grab-bar and the seat, therefore, should be delayed until the needs of the particular user are known. The suggested shower floor is well suited to concrete buildings but is not recommended for those of wood-frame construction.

## The Washbasin

A washbasin height of 790 mm is satisfactory for persons in wheelchairs but many people with ambulatory disabilities, who find it difficult to bend over, prefer a height of 900 mm. A compromise height of 840 mm appears to suit the needs of most individuals. Where possible, the washbasin should be placed within reach of a person seated on the toilet.

Some wheelchair users prefer a cantilevered washbasin, set out from the wall at least 150 mm to bring the bowl closer to the user. The mounts should be designed for a minimum edge load of 100 kg. A clear space under the rim edge 750 mm wide by 660 mm high is also required. A washbasin with a shallow front apron is convenient. Hot water pipes should be insulated for protection against burns. Where possible, the waste pipe should be extended and the trap placed close to the rear wall, freeing the space below the washbasin to accommodate a wheelchair. Insulation will not be necessary where a thermostatic mixing valve is provided that limits the water temperature to about 46°C.

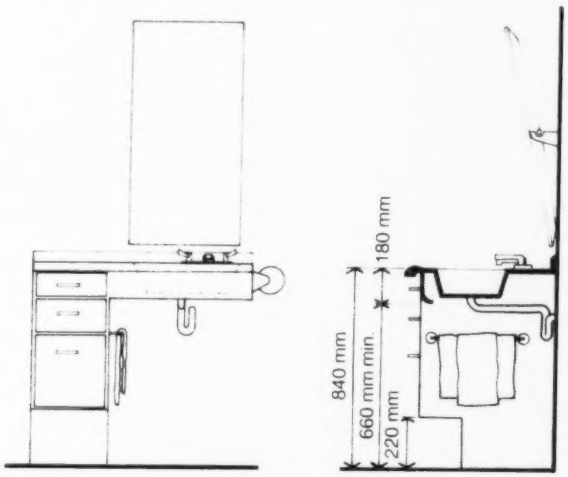
A vanity arrangement with a built-in washbasin meets the necessary standards and also may provide readily accessible storage space. The height of the counter should be 840 mm with at least 660 mm clearance between the counter and the floor. A bank of drawers or pull-out guides on one side of the unit may provide space for items that would otherwise be kept in a medicine cabinet. One drawer should be lockable to protect children from getting hold of medicines or dangerous objects.

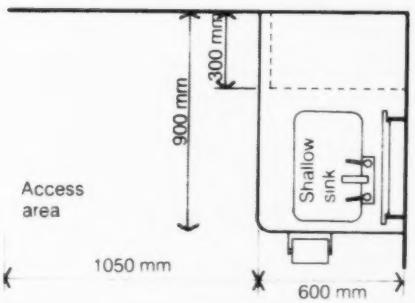
Lever handles should be used on the faucets. A spray attachment is useful if it can be extended as far as the toilet, where it may be used for washing a bedpan.

If the side of the vanity is next to a toilet, the toilet-paper dispenser may be attached to it. Also, the counter may provide support to the person using the toilet.

**Sink mounted in vanity counter. See layout F, page 43**

Note: Taps mounted off-centre, assuring access from toilet




**Layout** Given these criteria, various bathroom layouts are possible. Several sample plans are shown in the sketches. In each, the individual recommendations for the toilet, washbasin, bathtub and/or shower have been taken into account.

These layouts have a number of features in common:

1. The entry door is sliding or hinged; if hinged, it swings outward and leaves a clear opening of 760 mm.
2. A generous floor area is provided to allow wheelchair entry and manoeuvring. Sketch F shows the ideal case of a 1500 mm turning circle.
3. Where bathtubs are provided, they are a standard type, assuming that mechanical aids will be available for transfer from the wheelchair to the tub. A telephone style shower is provided, with all controls mounted on the side wall.
4. Grab-bars are provided for the toilet, the bathtub and the shower.
5. Both washbasin and vanity arrangements are shown.

Layout *A* shows a small, two-fixture washroom.

Layout *B* is a compact, three-fixture bathroom with entry on the long side.

Layout *C* is similar, but the changed positions of the washbasin and toilet result in a room shape that may not be practical in the overall plan.

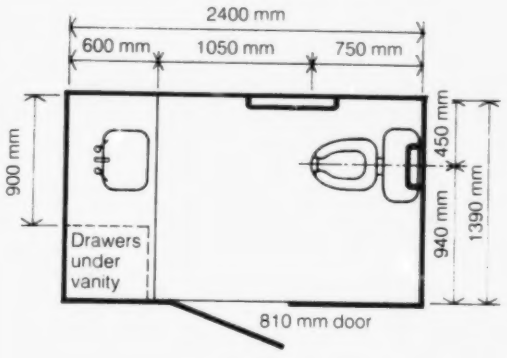
Layout *D* shows entry on the long side, with a shower in place of the bathtub. Side access to the toilet is possible.

Layout *E* allows entry on the narrow side, which is often useful. Although the plumbing arrangement is uneconomical, the position of the toilet allows side and front access.

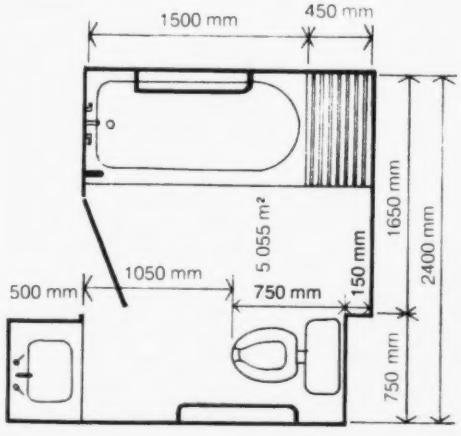
Layout *F* allows entry on the narrow side, as well as economical plumbing. Front access to the toilet is provided, and a complete wheelchair turning circle is possible.

**Storage** The conventional medicine cabinet set above the washbasin is not easily accessible to handicapped persons. If other cupboard space can be provided in the bathroom, the medicine cabinet should be replaced by an adjustable mirror or a mirror which has a lower edge mounted at a maximum height of 1000 mm. If a medicine cabinet is used, a type should be chosen that has wooden or plastic shelves, since glass shelves are easily broken.

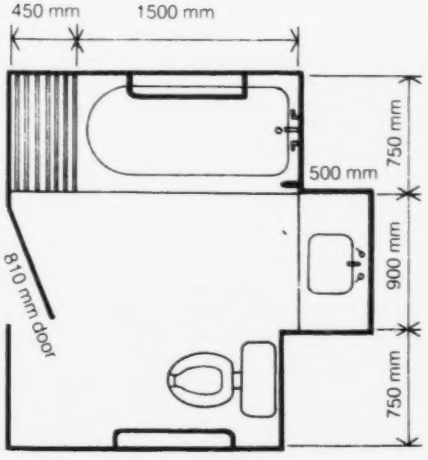
Layout A



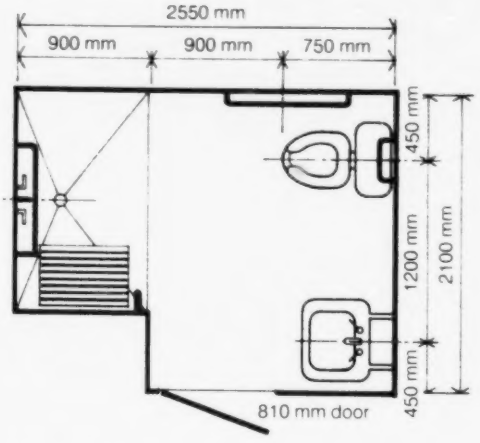

Layout B



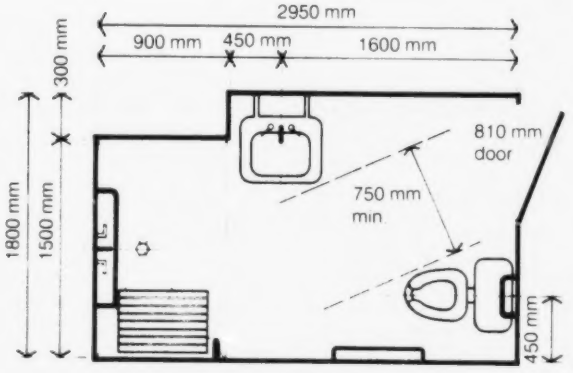

Layout C



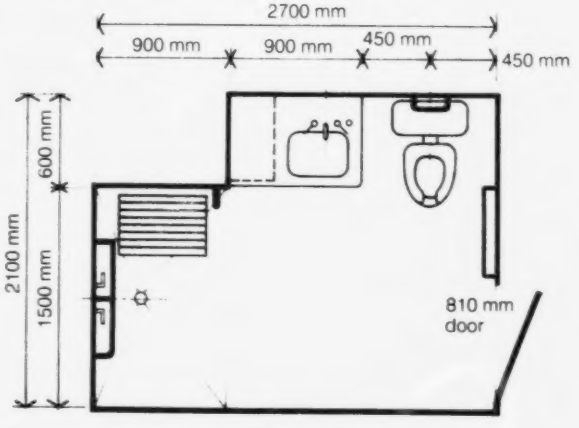

Layout D




Layout E




Layout F



*With limited mobility, storage within the dwelling becomes more important.*



**Grab-bars and Hoists** Grab-bars are an important element in bathrooms used by disabled persons. Those shown in the diagrams are intended to illustrate arrangements that will suit a wide variety of disabilities. Modification will be required to accommodate the needs of individuals. Grab-bars should be 30 mm to 40 mm in diameter and have a clear space of 40 mm between the bar and the wall.

Grab-bars and all bathroom equipment must be securely fixed to structural supports and be capable of carrying a 100 kg load. Disabled persons will clutch at anything if they fall—a washbasin, a vanity, or a shower curtain. All bathroom fittings should be selected and located to provide maximum protection in case of accident and should be capable of sustaining heavy use. For some disabled persons, a trapeze or travelling bar and hoist should be fixed to the ceiling to provide assistance in using the toilet and/or the bath. At the time of construction it is desirable to indicate structurally sound fixing points for these installations, since their location will be based on individual requirements.

**Other Features** Since most domestic accidents occur in the bathroom, a call button or other means of summoning assistance is necessary. The button should be located about 600 mm above the floor. The recommended alarm system is described on page 25.

A supplementary ceiling-mounted source of radiant heat is recommended. In a bathroom with a tub, the heater should be located over the tub; but in a bathroom with only a shower, a central location is preferred. The equipment should be governed by a 20-minute time switch that is not connected to the bathroom light switch.

# Storage Space

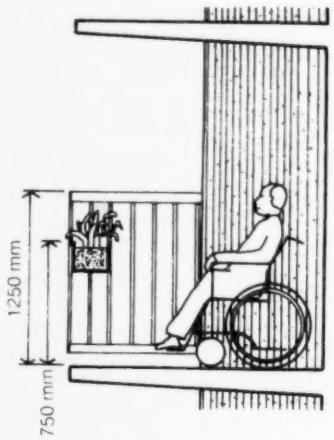
A generous storage area within the dwelling unit is necessary and a minimum of 5.5 $m^3$ is recommended. The contents of the general storage area must be accessible from a wheelchair. Full-width bifold or accordion doors will make it easier to reach the stored items. Shelves are very useful in making maximum use of a limited area. These should be adjustable in height, with secure attachments. These shelves will be useful only up to a height of about 1400 mm for wheelchair users. Higher shelves also should be installed if ambulatory persons live in the unit. All shelves should be about 400 mm in depth.

Ready access to closets may be provided by bifold, accordion, or sliding doors. The minimum clear opening should be 900 mm. Doors that require track or a floor-level guide rail are an obstruction. The clothes hanger rod should be adjustable in height, from 1200 mm to 1500 mm above the floor. The shelf above the rod should be placed at a maximum height of 1600 mm. Shelves built in at the side of the closet should be adjustable or placed at heights up to 1400 mm. This form of storage is convenient and reduces the amount of furniture required in the unit.

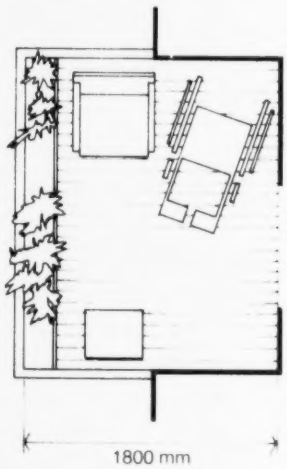
*When the location is right and access is good balconies will be popular.*



Section through balcony




Plan of balcony




# Balconies

Many disabled people living in apartment buildings are confined to their living unit for long periods of time. A balcony offers a welcome change of air, a chance to see street activity, and a place to grow flowers and enjoy the sun. It also may serve as an escape route in case of fire.

Access to the balcony is impeded if there is a threshold to be crossed from the unit's interior. A removable threshold may be used to reduce problems of water penetration.

If it is to be used by a person in a wheelchair, the balcony should be at least 1800 mm deep. The design should aim to achieve an effect of physical and psychological security. These factors are particularly critical in high-rise apartment buildings. Semi-recessed balconies offer the combination of a view, seclusion and a sense of safety. Railings should be designed to allow a view outward and down from a sitting position. Safety standards require an upper rail at a height of about 1250 mm. The upper rail is necessary for security but will not interfere with the view from a seated position. The top of planters should be at a level of 750 mm if the plants are to be tended from a seated position. As a preventative measure against accidents, such as children passing through or over guardrails, it is recommended that horizontal elements be avoided where these could be used as a ladder and that spaces between vertical elements be not greater than 100 mm.

The following additional guidelines are offered to assist in the design of balconies:

1. They should protect the users from cold prevailing autumn and spring winds.
2. They should allow maximum sun penetration.
3. They should provide privacy from adjacent balconies.
4. They should provide space for flower planters and flower pots.
5. They may include overhead radiant-heating panels to extend the season of use.

The inclusion of balconies in high-rise buildings has not been entirely successful, partly because of high winds, but also because some residents suffer from vertigo. The height at which balconies cease to be useful varies from one location to another; but above roughly the twelfth floor, they may be used only infrequently, and above the twentieth floor, they probably consitute an unnecessary expenditure.

*Minor items, but important for long-term convenience.*

*Remember too, the importance of orientation for sunshine, and an interesting view.*



# Lighting and Electrical System

The physical act of changing light bulbs in ceiling fixtures is difficult or impossible for many disabled people. Ceiling fixtures with a retractable cord should be installed, so that the light may be pulled down to a lower height when the bulb must be changed. Fixtures with more than one light bulb are useful also, so that when one bulb burns out, some light continues to be provided until a replacement can be made. Rheostat light controls allow for variation in individual need and preference.

There should be a switch to a light fixture or to an electrical outlet at the entrance to every room. It should never be necessary to pass through an unlighted area to reach a switch. Convenience outlets should be placed not less than 530 mm above the floor.

Light switches should be no lower than 840 mm and no higher than 1050 mm from the floor. This facilitates their use by persons in wheelchairs and makes it possible to operate them with the elbow. A large rocker switch can be easily worked by those with manual disabilities.

Light switches with locator lights should be provided in the entry hall, the bedroom-bathroom corridor, the bathroom and the bedroom. A generous number of wall-plug outlets throughout the unit contributes substantially to the lighting system's flexibility.

The entrance doorway to the apartment unit should be brightly illuminated for easy identification and operation of the key and lock.

The living area needs strong illumination for such activities as reading and sewing. Overhead lighting with a rheostat control may be used, augmented by a freestanding lamp.

The dining space often serves several purposes as a work, hobby, or play area. These activities require differing qualities and intensities of light and varying needs may be met by provision of a fixture with a rheostat control.

In the kitchen, wall or cabinet-mounted strip lighting should be installed to throw direct, shadow-free light over work surfaces, the stove and the sink area.

The design of lighting in the bedroom should be sufficiently flexible to permit the use of a variety of lamps and fixtures, including lampstands, bedlights and dresser lamps. Sufficient duplex outlets should be provided to make this possible.

In the bathroom, there should be a light over the washbasin, as well as an overhead lighting fixture.

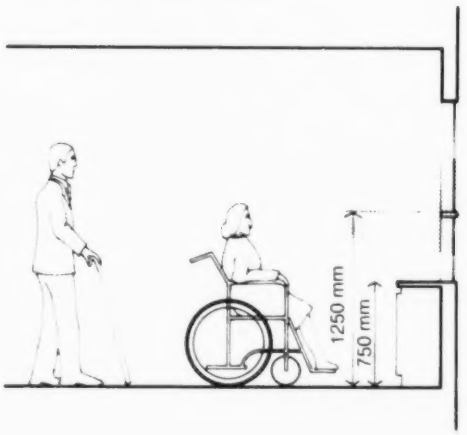
Finally, in all types of closets, a light should be provided, preferably one that is activated when the door is opened.

# Windows

Windows should be designed so that the lower sill is no more than 750 mm above the floor. This will allow a seated person to look outward and down. A sturdy railing should be provided at a height of about 1250 mm, so that the disabled person may stand at the window and look out with a sense of security. Window sills wide enough for plants are very handy. It should be possible to clean outside windows from inside the unit.

Sliding glass doors may be an additional source of natural light and air. Because they tend to create drafts, however, such doors are not recommended as the only source of fresh air in the room. Double-hung windows should not be used unless they are counterbalanced to ease operation. Casement or hopper type opening windows are preferable, since they can be opened easily with one hand. Window controls must be easy to grasp, operate and should be mounted no higher than 1350 mm above the floor.

Recommended window section



*The carpet vs. bare-floor controversy rages on.*

*Many opinions; few hard-and-fast rules.*



# Floors and Floor Coverings

Floors must be level, easy to clean and should be covered with a non-slip material. People using wheelchairs find that travelling across carpeting requires more effort than an uncarpeted surface, but they generally accept this disadvantage in the home to gain other benefits. Carpeting is easily maintained, it reduces the transmission of noise from wheelchairs and crutches, it has a pleasing appearance and contributes to the warmth of a room. It also reduces the seriousness of accidental falls. For disabled children who are encouraged to crawl, a carpeted floor is an advantage. Although it may not be possible to install special floor finishes to suit all individual needs, carpeting appears to be particularly useful as a directional signal for the blind and for those with poor eyesight. Changes in sound of floor covering can warn visually impaired persons of hazards they are approaching. In some situations, floor coverings can be selected for their particular sound characteristics.

Where carpeting is used, it should be a heavyweight, high-density type, with a short pile. Some problems have been reported with carpeting rippling under wheelchairs, making it difficult to move. A glued carpet may overcome this problem. Some carpets make it almost impossible to wheel a chair in a straight line. These should be avoided.

Floors should maintain their non-slippery qualities even when they are wet. In bathrooms, small unglazed ceramic tiles are recommended since they have excellent non-slip qualities, particularly if the edges are square rather than rounded.

Those using canes and crutches for support are particularly susceptible to accidents on slippery surfaces. Terrazzo or smooth vinyl flooring at main entrances or in bathrooms are dangerous when wet and should not be used.

Washing, waxing and polishing floors is difficult for disabled persons. Surfaces that rely on this treatment for maintenance and appearance should be used sparingly. Hardwood floors with a permanent finish require minimum maintenance and are attractive to look at. Non-slip waxes are available for hard surfaces that need maintenance, but they are often difficult to apply.

# Colour and Decoration

Surfaces should be easy to clean and maintain. Flat paint on walls is not recommended: semi-gloss is acceptable as a finish in all rooms and is fully washable.

Floor finishes, carpets and other furnishings should not have heavy patterns: they may be mistaken for obstacles or objects lying on the floor and may cause accidents if people try to avoid them. Patterned surfaces also may conceal real obstacles that can be seen clearly on unpatterned surfaces.

For persons with certain disabilities, particularly those who have poor coordination, it is desirable to emphasize the edges of door and window openings by colour symbols.

The choice of colour for wall surfaces is largely a subjective decision. Ideally, the individual occupant should be able to choose his or her own colour scheme. Where this is not possible, a range of light, unobstrusive colours is recommended for the interior of the residential unit, to allow maximum flexibility in the choice of furnishings and to increase the apparent size of small rooms. In public areas, bright colours and various textures are recommended.

*"The architect, builder and resident will profit from using this manual."*

G. Gingras

# 4 Design Features for Detached Houses

*The "desirable" design criteria applied to the special problems of single-family homes.*

*Security and accessibility are the basic requirements.*



Some problems in housing disabled persons are unique to ground-level housing units, such as detached, semi-detached and row houses. Many internal design features that may be included in houses have already been discussed on pages 28 to 47.

# Entrance to the House

The outside approach to the main entrance of the house should be protected by an enclosed porch or canopy to keep it dry and free from ice and drifting snow.

A hard paved area should be provided outside the entrance, at least 1500 × 1500 mm clear of the swing of the door. The paved area should be of a smooth, hard material, such as concrete or asphalt, and should slope gently away from the entrance to drain water from the threshold area.

At least two usable entrances should be provided to afford alternative escape routes in case of emergency. Entry doors should be at least 860 mm wide.

Storm doors are not recommended, since disabled persons find them difficult to operate. They should be used only where an enclosed porch or vestibule cannot be provided. An enclosed breezeway between the garage and the house makes a convenient entrance, but prevailing winds must be taken into account or a wind-tunnel may be created.

It should be possible for a disabled person to open a locked outside door with one hand. A grab-bar on the door frame beside the lock may be useful for support. There should be no step, threshold, or other impediment at the entrance, although in extreme climates a 15 mm weather bar may be necessary.

Inside the entrance, there should be enough clear space to manoeuvre a wheelchair. A minimum of 1500 × 1500 mm is recommended, with an area 600 × 1500 mm clear of the swing of the door. Since this space will be used also to brush snow from shoes, clothes and wheelchairs, a washable, nonslip floor material should be selected.

A coat closet with shelves for overshoes, hats and similar small articles should be provided in the vestibule, and there should be a seat or a chair available for those who have to sit down to put on or take off outdoor clothes.

A lockable delivery box is recommended for milk, bread, letters and other articles that are brought to the house. It should be placed about 850 mm above the floor and designed so that it can be emptied from inside the house.

To avoid drafts, the vestibule at each external door should be heated; alternatively, weather stripping should be installed to prevent seepage of cold air into the living area.

The vestibule should lead directly to the interior of the house, so that the disabled person does not have to make a sharp turn to the right or left.

*In the suburbs especially, disabled people depend a great deal on private cars.*

*Somewhat expensive, but essential for two- or three-storey houses.*



# Carport and Garage

A car can be used by most disabled persons if the controls are properly modified. Parking space should be provided with a minimum width of 3600 mm.

There should be direct access from the parked car to the house. The route should have a hard, level surface and should be protected from the weather. There should be enough space on the house side of the parked car to allow the driver or passenger to open the car doors fully.

Driveways should be short to minimize snow clearance, and parking should be as close as possible to the public right-of-way. Snow-melting by an underground heating system is desirable where costs permit. An outdoor electrical outlet should be provided for a block heater.

A heated garage is preferable to an open parking space or a carport. The chores of cleaning ice and snow from a car and starting it in cold weather are more than most disabled drivers can manage alone. Also, disabled persons are very sensitive to drafts and abrupt changes in temperature.

Electrically operated garage doors are preferable to manual doors. They should be controllable from a wheelchair parked at the side of the car in the garage, and from a point outside that is accessible to the seated driver by touch or by radio control.

A trapeze hung from the ceiling of the garage is often used to transfer a disabled person from a wheelchair or other ambulatory aid to a car. A permanent eyebolt suitably located and securely fixed to a beam or roof truss should be provided. The eyebolt should be capable of carrying a load up to 140 kg.

A two-way switch should be installed to allow the garage light to be controlled from inside the house or from the garage.

# Laundry

Provision should be made for washing, drying and ironing clothes on the main floor of the house, unless there is an easy means of access to the basement.

A combination washer/dryer eliminates the need to lift bundles of wet clothes. A front-loading machine with front-mounted controls is preferred. It may be placed on a platform to raise it to a convenient height. There should be a 1500 mm clear work space in front of the machines.

If an automatic clothes dryer is not available, a drying line or rack will be needed. Since these are normally difficult to use, it is best to study the individual's capacity and requirements and work out the most practical solution.

The standard portable ironing board is a flexible piece of equipment, but it is hard to set up. A built-in board adjustable to a height of 600 mm to 850 mm is preferable because it is more stable.

# Home Elevators

Many existing houses are two or three floors high and most have a basement. A small personal elevator will give the disabled person access to these floors. The elevator is necessary also where an existing garage is at grade, but the main floor is raised several feet—here the elevator offers almost the only possible entry.

An alternative to a home elevator is the platform lift or stair glide, but these must be selected carefully since some installations might conflict with the requirements of local building authorities.

*"A couple of steps, too narrow an exit, a small room and the individual becomes a prisoner of the environment."*

G. Gingras

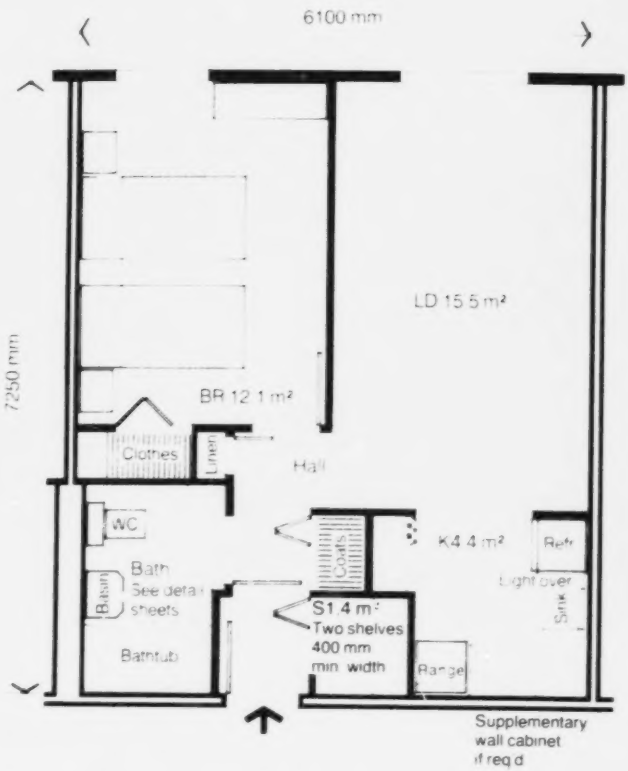
# Appendix

# Typical Unit Plans

The one-bedroom unit is a typical CMHC senior citizen unit modified to meet the standards for occupancy by a disabled person. The original senior citizen unit is shown for comparative purposes.

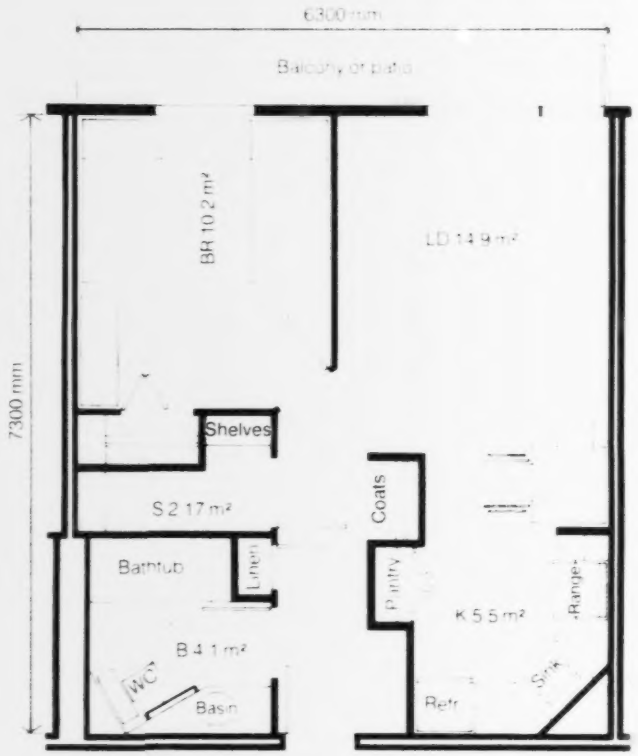
## Guide Plan

1-bedroom unit
Senior citizens
Total net area: 44.25 m²



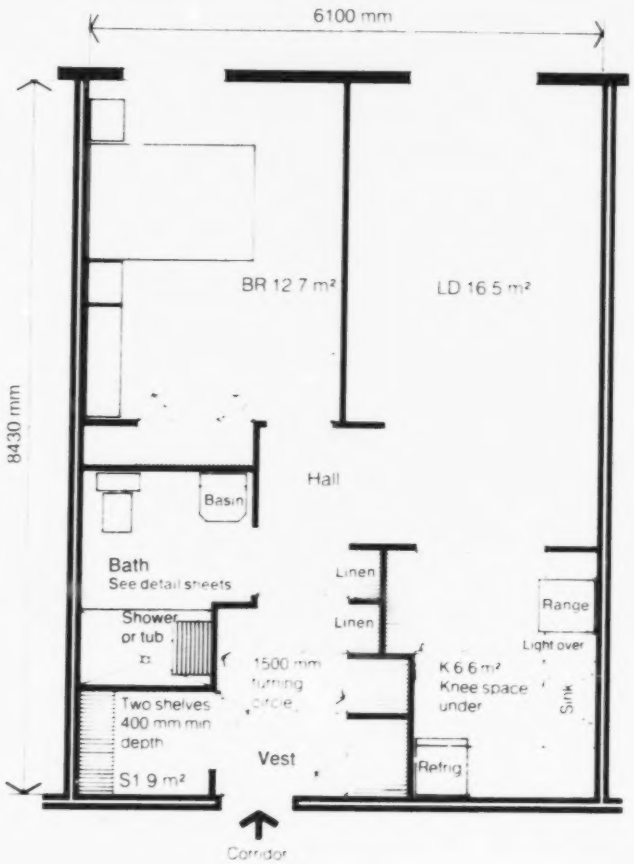
# Guide Plan

Barrier-free
1 bedroom unit
Total net area 46 m²



## Guide Plan

Barrier-free 1-bedroom unit
Total net area 51 4 m²

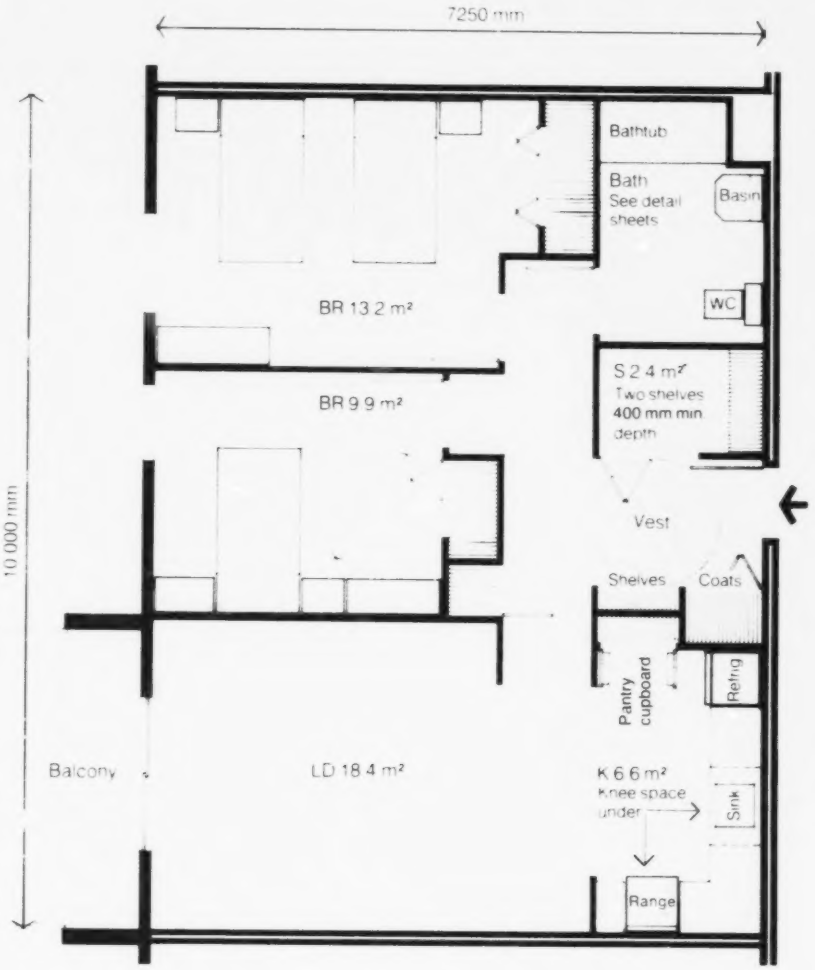



Note For apartment buildings with internal corridors and communal facilities

The two-bedroom unit is designed for occupancy of the large bedroom by two able-bodied persons and occupancy of the secondary bedroom by a disabled person.

## Guide Plan

Barrier-free 2-bedroom unit
Total net area 72.5 m²




Note For apartment buildings with internal corridors and communal facilities